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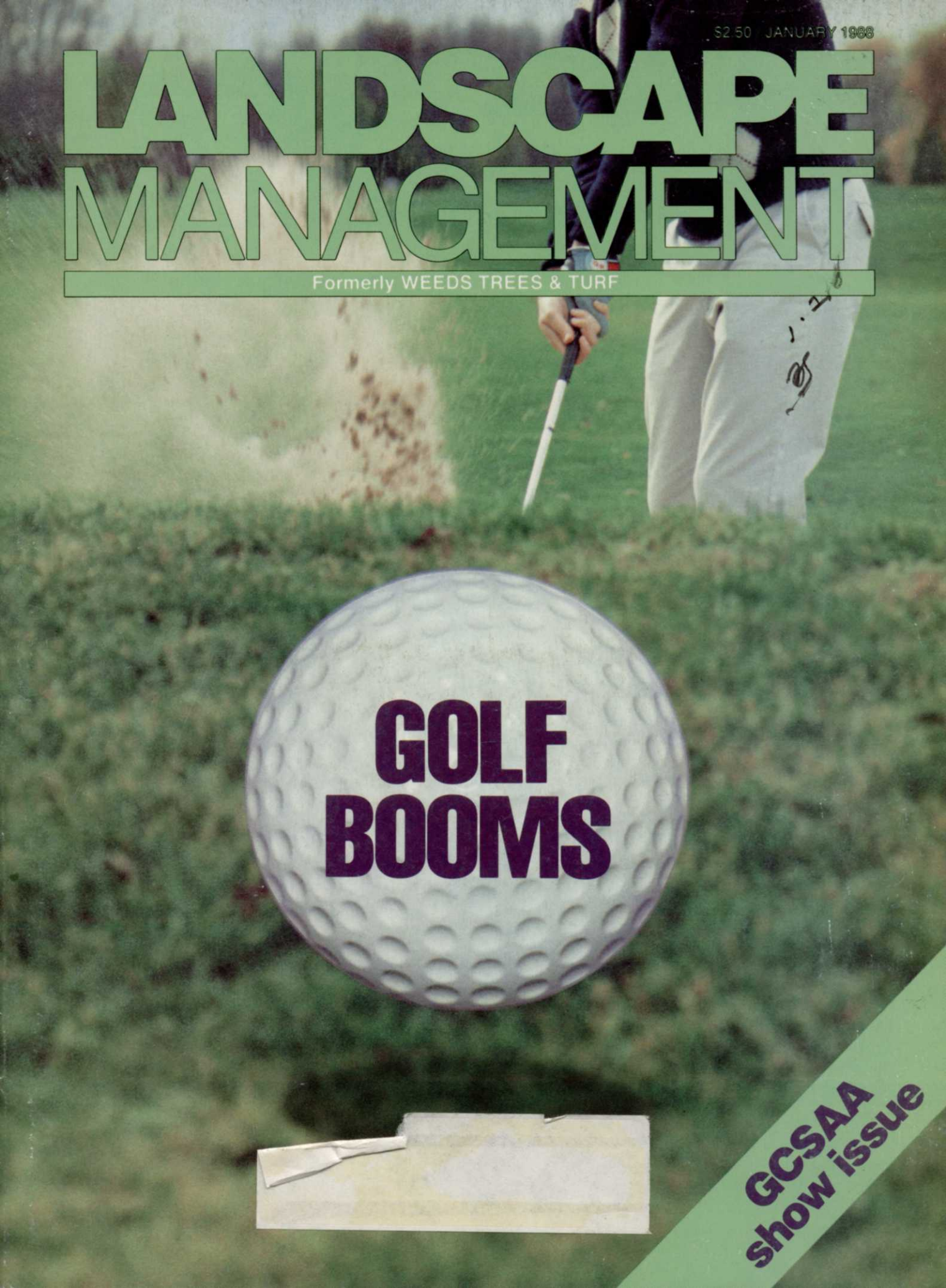

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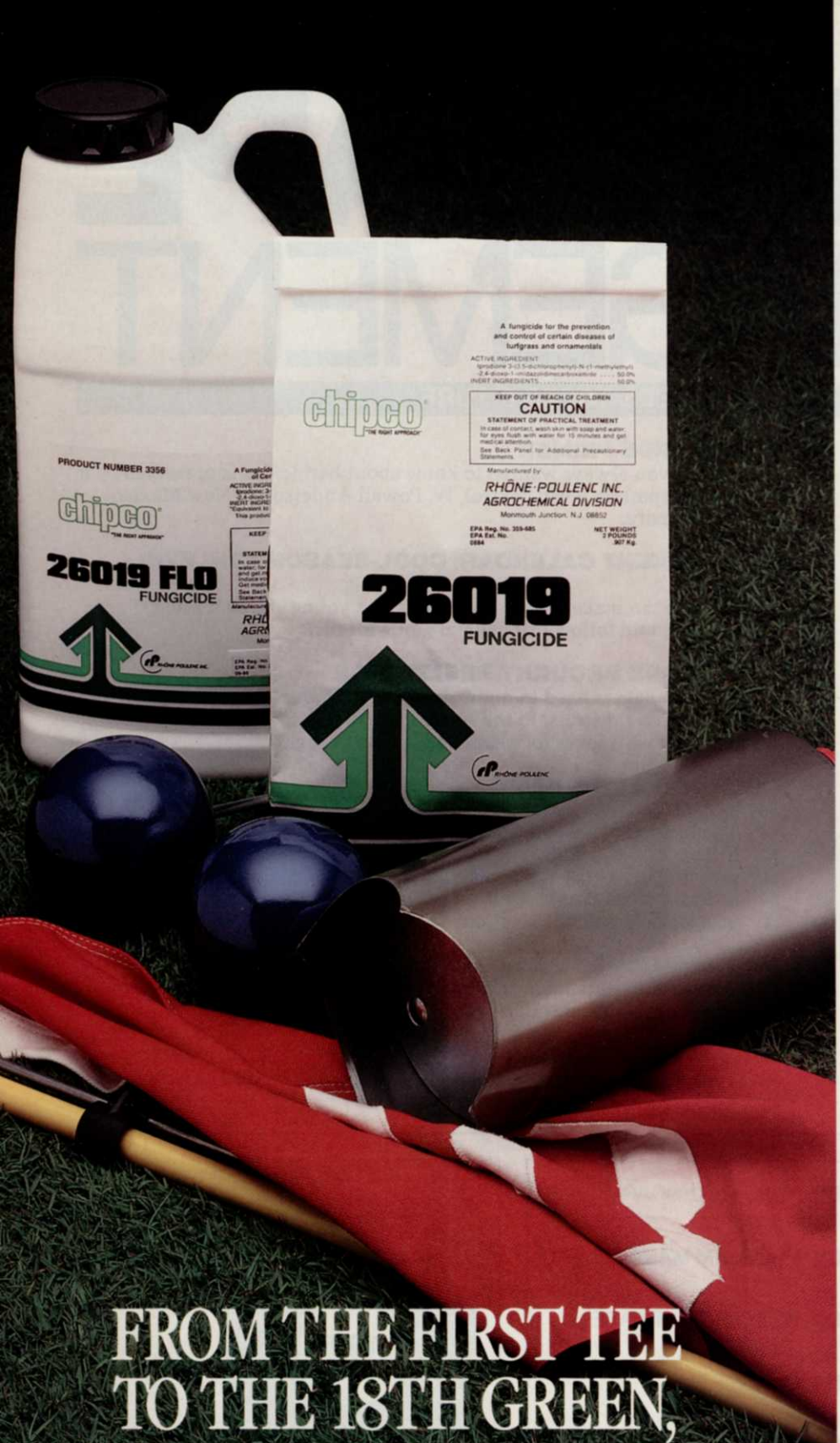

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JANUARY 1988, VOLUME 27, NUMBER 1

LANDSCAPE MANAGEMENT

Formerly WEEDS TREES & TURF

44

58

20 A HERBICIDE PRIMER
Everything you always wanted to know about herbicides is presented by a long-time expert on weed control, W. Powell Anderson of New Mexico State University.

26 MANAGEMENT CALENDAR: COOL-SEASON ATHLETIC FIELDS
Quality turf can make athletic fields safer for young athletes. Field managers should follow this general guide for turf.

32 TURFGRASS DROUGHT RESISTANCE
Turfgrass managers need to understand the difference between water stress and drought stress. In the second part of this four-part water series, we look at what it takes for plants to adapt to drought.

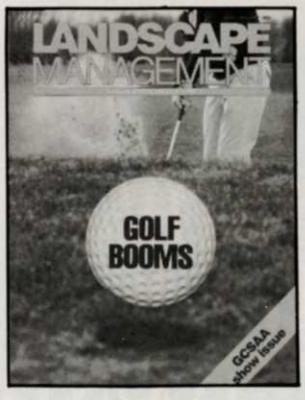
37 GOLF COURSE SPECIAL
38 COVER STORY: Boom!
44 The Making of a Great Course
52 In Touch With Nature
58 Building the Links at Spanish Bay
64 A Strong Recovery for Golf
70 Special Golf Products Section

80 MANAGEMENT COMMITTEES...YECCH!
Golf course superintendents are consistently great about dealing with agronomic problems. But there are other problems.

82 ARTICLE INDEX
An index, by both subject matter and author, of the feature articles carried by LANDSCAPE MANAGEMENT in 1987.

DEPARTMENTS

4 NEWS/TRENDS
6 GREEN INDUSTRY NEWS
8 SHORT CUTS
30 ON DESIGN
86 TURF CALENDAR
88 PROBLEM MANAGEMENT
92 RESEARCH UPDATE
94 CLASSIFIED
106 AD INDEX



On the cover: Assistant editor Jeff Sobul gets a good bit of sand, along with the ball.

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NEWS/TRENDS

by the Editorial Staff

Golf course maintenance exceeds $3 billion

■ The U.S. golf course maintenance industry has reached an estimated annual worth of $3.54 billion, according to the 80-page Golf Course Maintenance Industry report co-produced by the GCSAA and the National Golf Foundation.

The report, broken into nine geographic regions, covers irrigation sources, expenses, labor hours and wages, golf car fleet size and maintenance costs, environmental conditions and professional responsibilities for each region.

Data was collected through a 10-page survey administered in November, 1986. Information is presented in a form that allows a superintendent to make comparative analyses of operations with other courses in the region.

"For more info, NGF 1150 S. U.S. Highway 1 Jupiter, FL 33477"

Real estate development takes part in boom

■ Golf-oriented real estate developments have spread from their origin in the Sun Belt throughout the country, fueled by low interest rates allowing course construction.

According to Roger Rulewich, president of the American Society of Golf Course Architects, "the majority of new courses are tied in with real estate developments."

The reason is simple. "Golf courses add to the overall appreciation of the property," says Amy Zale, vice president for marketing for Chicago-area developer the Zale Group. "Units with golf course views are the most valuable property sites and sales for these units will always be steady," she adds.

But it might be a good idea to get reinforced glass windows.

Consumer pesticide, fertilizer markets up

■ According to an upcoming report by agribusiness consultants C.H. Kline & Co., sales of consumer pesticides and fertilizers were expected to reach $2 billion in 1987, a 5.5 percent average annual increase from 1984 levels of $1.7 billion.

Along with this growth has come a shift in the retail distribution patterns of the generally convenient, easy-to-use products from lawn and garden centers and hardware stores to discount department stores.

Products encompassed by the survey range from lawn fertilizers to indoor and pet insecticides.

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GOLF

Four-putt green? Try new Blackwolf Run

Former Blackwolf Run superintendent Don Cleamons waves from the middle of the No. 14 green at Blackwolf Run—all 20,000 square feet of it.

Nestled in a backwoodsy corner of Wisconsin is 6,800 yards of naked earth taking on a new shape. Construction crews are erecting what will be one of the toughest golf courses on the North American continent.

The Kohler Company hopes to have Blackwolf Run Golf Course completed in time for this summer's golf season.

It's a Pete Dye course that has been designed as a professional tournament course. When it's completed, its PGA rating should be neck-and-neck with the PGA West's 77.2, most difficult in the country.

You want length? Try the 566-yard No. 1 hole. Or the 556-yard No. 7. Or the 510-yard No. 10.

You want difficulty? Try No. 4, with its blind shot to the green. Or No. 14 with its 20,000-square-foot green bulkheaded by 400 feet of railroad ties shown here.

Blackwolf Run is a natural-appearing course, though being far from natural. It's all Penncross bentgrass with fairways and greens surrounded by plenty of colorful wildflower mounds. Intermediate rough is bluegrass with roughs of fescue, bluegrass and prairie grass. Much of the rough will not be mowed.

The golf course is being built to help attract summer vacationers to the nearby America Club Hotel, also run by Kohler.

Says one Kohler source: "People don't play much golf in Palm Springs in June, July and August. We hope executive types on vacation from cities like Chicago, Minneapolis and Detroit come up here and play."

AWARDS

Sarazen to receive 'Old Tom' from GCSAA

Golf legend Gene Sarazen will receive the 1988 Old Tom Morris award from the Golf Course Superintendents Association.

GCSAA will present the award to Sarazen, the sixth recipient, Feb. 8 at the closing banquet of the 59th International Golf Course Conference and Trade Show, which begins February 1 in Houston.

Sarazen was the first of just four people to win golf's Grand Slam. He is also the developer of the sand wedge.

Sarazen, now 85, joins Arnold Palmer, Bob Hope, Gerald Ford, Patty Berg and Robert Trent Jones Sr., as Old Tom recipients.

RESEARCH

Pesticides a victim of guilt by association?

Despite continued increase of pesticide use over the last 15 years, 23 of the 33 major life-threatening birth defects have stabilized or decreased, according to Dr. Stanley Shuman, medical director of the Agromedicine Program at Clemson University in South Carolina.

Shuman attributes the rise of the other 10 to hightened awareness and improved diagnostic techniques, especially for the four cardiovascular defects.

He notes, however, that only the increases are reported by news media, sometimes resulting in removing products from the market.

Shuman reports that, statistically, one in every 100 births will result in a major birth defect, three in 100 a minor one, no matter what.

Statistics show that 25 percent of birth defects are genetic or chromosomal in nature, 10 percent environmental (not necessarily from pesticides) and 65 percent from unknown reasons. Shuman claims it is often these unknowns that suddenly become a result of pesticides. But there is no proof.

While cancer is on the rise, Shuman says it is not a result of pesticides, but of an aging population. "The aging of cells causes cancer," Shuman says.

In addition, he notes that naturally occurring, plant-derived toxins occur in the average diet in concentrations sometimes as much as 10,000 times that of man-made pesticides.

Shuman spoke at the PLCAA convention last November.

LEGISLATION

N.Y. groups unite against legislation

Commercial pesticide users in New York have banded together, attempting to overturn the strictest proposed pesticide regulations ever written by a state agency.

If the regulations go into effect as written, everyone who applies a pesticide will have to post warning signs—everyone except homeowners.

Affected industries have spent the last six months objecting to the regulations and urging customers to write their elected officials. But the objections have not deterred the Department of Environmental Conservation.

Last spring, assorted landscape managers and nurserymen formed the New York State Green Council. This past fall, the council hired a lobbyist.

"We've been very segmented up until the last six months," notes Bill Stark, vice president of the New York State Turfgrass Association. Stark is both an LCO and a golf course superintendent.

The New York State Lawn Care Association, in addition to supporting the green council's efforts, has doubled the lobbying muscle by hiring its own lobbyist.

The regulations for lawn care applications are probably the most stringent of all. Among other provisions, LCO will have to place signs saying "Do Not Enter This Property" every 12 feet around the total perimeter after an application.

Golf courses will post at the pro shop, snack bars, bathrooms and clubhouse on every door, Stark says. Institutions and universities must post doors and two common areas, regardless where spraying is being done, he adds.

Public hearings on the regulations have been swamped with industry representatives, and input has been overwhelmingly against the regs.

One company, Lawn Medic of Bergen, N.Y., sent petitions to 400 customers. About 50 percent signed and mailed them back. The petitions have been shown to legislators.

"A number of the important people in the (legislative) assembly are coming out on our side of the regulations, mainly because they go way above the implied intent of the law," says Don Burton, president of Lawn Medic.

Woodlawn Cemetery sexton James Webber points out the cemetery map and directory used to locate plots.

CEMETERIES

Cemetery engraves plot directory on computer, gets good response

Woodlawn Cemetery in Claremore, Okla., has put its directory of deceased and pre-need plots onto a computer. According to Larry Roberts of Don Griffey & Assoc., Tulsa, the company that put the directory on line, it is the first such list in the country to be computerized.

Stored in the computer are 25,000 names, about 14,000 of which are of deceased, plus directions to grave and plot locations, displayed on a board at the entrance to the cemetery, says cemetery sexton James Webber.

The system went into operation March 1, 1987, and Webber says, has proven very successful. "It's beneficial to out-of-state people," he says. Because of the directory and the cemetery's reputation for excellent maintenance, Webber says, "People have come up from (nearby) Tulsa to buy space."

Webber adds that inquiries have come in from other cities around the country, including Denver, about installing such a directory and the cemetery maintenance program.

RESEARCH

N: no more 'pour-it-on,' Dr. Beard says

A number of trends are developing in turfgrass nutrition strategies as the decade nears its completion, says James Beard, Ph.D., Texas A&M University.

Beard cited four developing trends in a speech to attendees of the Professional Lawn Care Association of America's annual conference in San Antonio in November.

Dr. Beard

The first trend is toward lower application rates of nitrogen. This is a move away from the "pour-it-on" philosophy of the past. New research shows that over-applying N can result in loss of carbohydrates needed for winter hardiness in cool-season areas, plus a greater susceptibility to disease as a result. Also, the increased shoot growth would result in more mowing and the removal of nutrients with clippings.

Beard also noted that applications of potassium will increase. He currently recommends applying it at rates of 65 to 85 percent of N once the soil has been raised to the optimum K level, then eventually going to a 1:1 ratio of N to K.

He suggests applying K every three to four weeks during the summer on cool-season turf because it will help

SHORT CUTS

SAND, SAND EVERYWHERE... But not a drop to use. Most golf courses in Hawaii use manufactured sand because of a 1975 state law prohibiting use of natural coral sands from the beaches. The other alternative is to use volcanic cinder in greens. "Sands are not all the same," says Charles Murdoch, Ph.D., of the University of Hawaii.

SAME THING WITH TURF... Not only is sand scarce in the islands, but so is sod. Hawaii has only about 25 acres in sod production for the entire state. Many new turf varieties must be quarantined for up to two years before they can be brought from the mainland to the islands. Sugar cane is susceptible to the same viruses as turf, and it would take just one virus to wipe out the entire crop.

NEBULUS NEMATODES... It appears that the pest-fighting nematodes which infect Florida housecrickets is a different, previously unidentified species. Grover Smart, Ph.D., of the University of Florida's entomlogy department told the Florida Turfgrass Conference that research proving the nematode's identity will be released shortly.

CONGRATULATIONS... Gayle Jacklin, domestic marketing representative for Jacklin Seed, Post Falls, Idaho married Scott Ward on December 5. Ward is a management-trainee with lumber/paper company Boise Cascade. Gayle will use the last name Jacklin-Ward professionally.

BALANCING THE BUDGET... Marvin Gross, owner of Marvin's Gardens, Sarasota, Fla., has a favorite term when it comes to balancing the old budget. The word is "wobble-ate," and it means doing some fancy fudging of numbers when appropriate. From what was said at a panel session presented by the Associated Landscape Contractors of America, most landscape contractors are adept "wobble-ators."

A PERFECT FIT... Golf courses and homebuilding go hand-in-hand, as housing developments are proving across the land. According to the Urban Land Institute in Washington, D.C., a residential lot located on a golf course is worth up to 50 percent more than a "no golf" alternative.

recovery in high traffic areas.

Beard feels regular use of iron for rooting will be the norm down the road. While he says that iron exists in the soil, it is rarely in usable form. Thus applications in small amounts will benefit shoot and root growth, color and drought hardiness. He notes that visible results of iron are quick, often less than a half hour.

The trend farthest in the future, Beard believes, is fertilization based on tissue analysis. New technology, he says, will be able to analyze tissue for nutrient content and return results within two days. The cost will be high initially, though, he says.

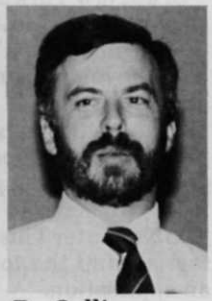
RESEARCH

Runoff control affects groundwater

The degree of runoff control has an impact on groundwater quality, says Thomas Watschke, Ph.D., Penn State University.

Watschke notes that the main collection points for runoff water are watersheds, which land development often takes away. Not only is the water not given a chance to percolate and filter through the watershed, it is often lost as a resource because it runs off into creeks and rivers and eventually out to sea.

Dr. Watschke



Dr. Sullivan

Michael Sullivan, Ph.D., University of Rhode Island, says that pesticides often gather along with other toxins. Both Watschke and Sullivan agree that periodic flushings, or alternate periods with and without rain, result in higher concentrations of toxins in runoff water because they are allowed to build up on surfaces like curbsides and roofs. When the built up material is flushed, the concentrations are thus higher.

Research performed by Watschke shows that established groundcover will go a long way toward reducing runoff and filtering out dirt particles holding toxins.

Ideally, sod presents the best solution, if affordable. It is immediate and most effective, able to handle the equivalent of six inches of rainfall per

Continued on page 15

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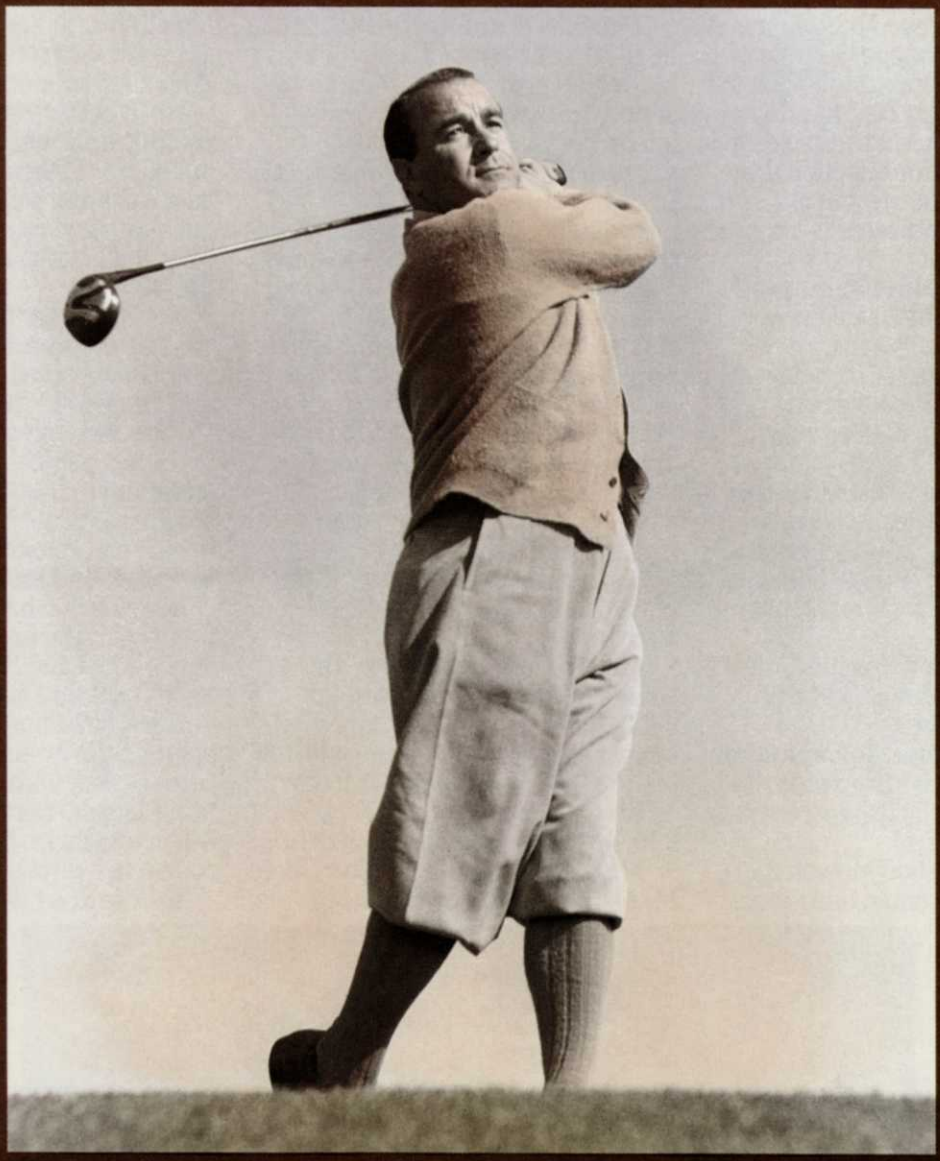
Until now, this was the most dramatic second shot in golf history



Gene Sarazen sinks his second shot for a double-eagle on the par-5 15th hole on his way to winning the 1935 Masters.

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The 3325 boasts features like single-lever reel lift, full-size interchangeable grass catchers and unequaled service access. Features you'll read more about on the two-page overleaf.

New walk-behind units include the 22R Greens Mower and the 529 Vacuum/Blower.

The 22R Greens Mower makes quality cuts more affordable. Its enclosed differential drive delivers excellent tracking.

Like the 22 Greens Mower, the 22R has cast aluminum alloy drive rolls and a standard high-speed, tool-steel bedknife for durability. An optional tournament bedknife delivers precision cuts down to 7/64-inch.

The 529 is unique because it can be used as either a vacuum or a blower. You get the best of both by simply turning a lever. It features a 5-hp Kawasaki engine, 30-inch vacuum nozzle and a durable 8.4 cu. ft. synthetic felt bag.

For bigger cleanups, there are the new 141,151, and 161 Vacuums. Machines designed for work on turf and pavement—wet or dry.

The 141 and 151 Vacuums are engine-powered units that clear 4- and 5-foot swaths, respectively. Both have electronically balanced impellers that crush and mulch debris before it gets to the hopper—a hopper you can empty without leaving your seat.

Important options include a stationary brush and a hand-held hose attachment.

The 161 Vacuum offers all this in a PTO-driven unit. Its 5-foot wide vacuum and 3.5 cu. yd. hopper are designed to work with any 40- to 70-PTO-horsepower tractor.

Two new blowers, the 30 and 230, help clear and windrow debris.

The 30 Blower fits on John Deere F930, F932, or F935 Front Mowers. The 230 attaches to any Category 1 3-point hitch on tractors with 20 horsepower or above.

Both generate air velocities up to 250 mph with balanced, 6-blade impellers. They also allow you to easily change blower direction without leaving your seat. (A 90-degree front deflector is also available for the 30.)

And the story doesn't stop here. **Two new spreaders,** the 206 and 209, are now available for top dressing and other solid material spreading.

The 206 Spreader can handle up to 600-lb. payloads, while the 209 stands up to 1000 pounds of material.

Quick-change sand and fertilizer spouts can spread material from 12 to 40 feet and are available for both.

The 140S Shatter Aerator rounds out the line. It joins last year's 260S and 280S as the best tools you'll find for aeration.

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Frame design allows the 3325 to carry a full-size grass catcher on the center cutting unit.

As you mow, features like power steering, differential lock, 12-function systems monitor, cruise control, and a 20-gallon fuel tank help make you more productive.

Service is also a snap. Here, a hinged fuel tank and engine cowling give unequaled access to the entire drivetrain.

All told, the 3325 is an entire collection of advantages you won't find on other machines. Advantages that make your operation more productive, your course better kept.

Talk to your distributor for a look at this impressive new mower today.

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NEWS *from page 8*

hour without runoff. New seeding, a more common and affordable practice, is less effective but also reduces runoff in time.

Sullivan suggests a more direct way to reduce pesticides in runoff and groundwater. Use less. Pesticide use has doubled since 1960, he says. The green industry accounts for 28 percent of all pesticides used.

Sullivan believes a trend toward less persistent chemicals is necessary, as well as a push for Integrated Pest Management (IPM) on a more widespread basis. "If you don't reduce the application of pesticides, you'll reduce the availability of pesticides," he says.

Watschke and Sullivan spoke on groundwater and runoff at the eighth annual Professional Lawn Care Association of America conference.

LAWN CARE

Tru Green acquires Old Fox Lawn Care

Tru Green has strengthened its market position in the New England area by acquiring Old Fox Lawn Care, East Providence, R.I. Old Fox had revenues of $9.5 million in 1987 with branches in Connecticut, Rhode Island and Massachusetts. Atlanta-based Tru Green had less than $4 million in these markets.

Tru Green, a wholly-owned subsidiary of Oak Brook, Ill.-based Waste Management, Inc., will consolidate some of the two companies' branches, according to president Howard Evers. All employees will be kept, however, and the Old Fox management will be given more responsibility.

Bernard Buonanno, Jr., former president of Old Fox, will oversee all the Tru Green operations in the northeast region, Evers said. John Kenenski, former operations manager of Old Fox, will be the region's general manager.

Even the Old Fox name will remain. The branches will carry the title: "Old Fox, a Tru Green Company."

AWARDS

Irrigation Association honors Mel Hagood

The Irrigation Association named Mel A. Hagood its 1987 Man of the Year at the International Irrigation Exposition and Technical Conference in Orlando last October.

Hagood, now an irrigation consultant, amassed 40 years of experience in the irrigation industry. Most recently he was a professor at Washington State University, from which he retired in 1977.

His work as the United Nations' consultant has taken him to Cyprus, Morocco, Iran, Bangladesh, India, Sri Lanka and Yemen.

Also, Terence D. Heiler, director of the New Zealand Agricultural Engineering Institute, received the IA's Crawford Reid Memorial Award. He was recognized for making significant achievements in the promotion of proper irrigation practices and brought advancements to irrigation outside the United States.

The association honored Robert B. Daugherty, CEO of Valmont Industries, Valley, Neb., with the Irrigation Industry Achievement Award for contributions to the development of the industry and the products used by it.

William R. Pogue, president of Irrometer, Inc., Riverside, Calif., is the new president of the association. He is joined on the executive committee by Richard Hunter (president-elect); Glenn Tribe, (vice president); Michael Sypolt, (treasurer); John Riddering, (past president); and Bob Sears, executive vice president and chief operating officer.

Continued on page 16

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NEWS *from page 15*

Elected to the board of directors were Larry Cox, William Gibson and William Koonz.

TREES

For trees, LCOs need a 'total commitment'

Bob Felix, executive vice president for the National Arborists Association, was the voice of reason and caution in his talk to lawn care operators at San Antonio's Professional Lawn Care Association of America conference.

Bob Felix

"You need a total commitment from a lawn service firm if it's going into tree care," Felix emphasized. "Tree care is labor intensive, with high turnover. It takes a certain mentality to go to the top of a tree 80 to 100 feet up hanging on a rope.

"It's safe if done properly. The hazards are there, especially powerlines." Equipment such as chain saws and chippers must be used properly, he adds.

Equipment is expensive. A truck with a chipper can cost $35,000, an aerial lift as much as $75,000, according to Felix.

Maintenance costs, debris disposal and different estimating tactics are also considerations. "It is easier for a tree care business to get into the lawn care business than it is for the lawn care business to get into tree care," says Felix.

He adds that spray techniques are different as well. Tree care's target spraying, and application techniques have improved, he says. But, "it takes a knowledge of application principles to get a high-pressure sprayer pointed in the right direction."

CONFERENCES

Plane crash deaths mar 8th PLCAA show

Among the victims of Continental Flight 1713, which crashed on take off from Denver en route to Boise, Idaho, were Jim Marria of Perma Green Lawn Co., his wife Karen and two other Perma Green employees. They were all returning to Boise following the eighth PLCAA Conference and Trade Show in San Antonio, November 15.

Russ Frith of Lawn Doctor (left) receives congratulations from PLCAA's Jim Brooks after the former was elected 1988 PLCAA president.

Jim Marria had served PLCAA as director, secretary/treasurer, vice president and president in 1986.

"The current success and financial stability of our association is due in large part to Jim's leadership over the past six years," PLCAA executive vice president James Brooks wrote in a letter to PLCAA members.

He and his wife are survived by two sons, Craig, 17 and Mark, 16.

Nick Ysursa, Marria's brother-in-law and Boise branch manager, and director of technical services John Stewart also died in the crash. Mike Spicer and Doug Self, both of Perma Green, survived the crash, as did Tom Denker and Barbara Hooper of Evergreen Landscape in Ketchum, Idaho.

The Marria family has set up a Bishop Kelly High School Scholarship fund in memory of the Marrias and Ysursa. Contributions can be made to: Marria-Ysursa Scholarship Fund, c/o Dr. Dean Sorenson, 5197 Redbridge Dr., Boise, ID 83703.

The deaths marred what was otherwise considered a successful conference. Though attendance was down to 1,250 this year as opposed to 1986 totals exceeding 2,000, seminars were well-attended.

A record 163 exhibitors covered 33,600 net square feet of exhibit space, and outdoor demonstrations were well-attended despite some rain.

Four new board members were elected at the show as well. They are J. David Fuller of Fullcare Turf Maintenance, Louisville, Ky.; Richard Miller of Ever-Green Lawns, Golden, CO.; Richard Steinau of Greenlon, Cincinnati, Ohio; and Richard White of ServiceMaster, Wheaton, Ill.

In addition, the PLCAA reports that 353 new members joined the association in 1987, exceeding the goal of 300, and bringing the total membership to 1,300.

"We're going to have another very, very good year in 1988," Brooks told members at the annual business meeting where Russ Frith of Lawn Doctor, Matawan, N.J. was elected new PLCAA president.

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A HERBICIDE PRIMER

Everything you always wanted to know about herbicides is presented on this and the following pages by a long-time expert on weed control.

by W. Powell Anderson, Ph.D.

Herbicides are chemicals that kill plants. About 30 herbicides are registered for use in turfgrass. Their value lies in their ability to selectively kill weeds with little or no injury to the turfgrass.

To use these chemicals effectively, you need to know the turfgrass species involved, to correctly identify the targeted weed species, and to know the characteristics of the herbicides available for use in turfgrass. From a practical viewpoint, you should know the answers to the following questions about a turfgrass herbicide before purchasing and applying:

1. Is it safe to use on your turfgrass species or cultivar?

2. Will it control your problem weeds?

3. When must it be applied relative to weed and turf growth?

4. Is it a contact or systemic herbicide?

5. Does it volatilize—and if so, do the vapors pose a problem?

6. Is the product applied as an aqueous spray mixture or as dry granules or pellets?

7. What effect does rainfall or irrigation have on its activity?

Answers to these questions are found on the product label.

Pertinent herbicide characteristics include the following: (1) selective or non-selective, (2) pre-emergence or post-emergence, (3) contact or systemic, (4) volatile or non-volatile, (5) product formulation, and (6) effect of rainfall or irrigation following application.

Selective or not?

Selective herbicides kill some species of plants, but not others. The particular herbicide chosen for use in turf should not cause significant injury to the turfgrass species, but, at the same time, it must provide adequate control of the problem weeds.

Thus, herbicides used for weed control in turfgrass are selective herbicides, killing problem weeds with little or no injury to the turfgrass. Examples of selective turfgrass herbicides include the phenoxy herbicides (2,4-D, MCPA, dichlorprop and mecoprop); the dinitroaniline herbicides (benefin, oryzalin, pendimethalin, prodiamine and trifluralin); and others such as bensulide, bentazon, bromoxynil, DCPA, dicamba, ethofumesate, fenoxaprop-ethyl, MSMA, oxadiazon, pronamide and siduron.

Some of these herbicides control young broadleaf (dicot) weeds, but not grass weeds. Some control grass weeds, but not broadleaf weeds. Others control certain species of both broadleaf and grass weeds. Most turfgrass herbicides control young annual weeds, while a few are effective against both seedling and established annual and perennial weeds. Some of the turfgrass herbicides will kill one kind of turfgrass but not another.

Non-selective herbicides kill all, or almost all, actively growing plants, weeds and turfgrass. Non-selective herbicides may be used in turf renovation and at time of seedbed preparation. Some non-selective herbicides may be used selectively in dormant warm-season turf, such as Bermudagrass, to control winter weeds.

Examples of non-selective herbicides are cacodylic acid, glyphosate, metham, methyl bromide, metribuzin and paraquat.

TURFGRASS HERBICIDES

Common Names	Trade Names
AMA	Super Crab-E-Rad, Super Dal-E-Rad, Super Methar
asulam	Asulox
benefin	Balan
bensulide	Betamec, Betasan
bentazon	Basagran
bromoxynil	ME4 Brominal, Buctril, Nu-Lawn Weeder
cacadylic acid	Phytar 560
DCPA	Dacthal
dicamba	Banvel
dichlorprop or 2,4-DP	in Super Trimec products and in Weedone DPC products
endothal	Endothal Turf Herbicide
2,4-D amine	Dacamine, DMA-4, Weedar Emulsamine, Weedar 64, others
2,4-D LV ester	Esterone 99 Concentrate, Salvo, Weedone LV4, others
DSMA	Drexel DSMA, Helena DSMA, Vertac DSMA, others
ethofumesate	Progress
fenoxaprop-ethyl	Acclaim (registration expected in 1987)
glyphosate	Roundup
mecoprop or MCPP	Chipco Turf Herbicide, Mecomec, Weedone MCPP, others
metham	Vapam
MCPA	Chiptox 2E
MSMA	Bueno 6, Daconate 6, Dal-E-Rad 120, Drexel MSMA, others
napropamide	Devrinol
oryzalin	Surflan
oxadiazon	Ronstar
paraquat	Gramoxone
prodiamine	Blockade (registration expected in 1988)
pronamide	Kerb
siduron	Tupersan
simazine	Princep
trifluralin	in Team

Herbicides are usually applied after weeds have emerged to established stands of turfgrass and to warm-season species when dormant, with no green vegetation showing aboveground. Some may be applied before weed emergence (siduron) or after the weeds emerge (bromoxynil) in new seedings of turfgrass.

Pre- or post-?

Turfgrass herbicides are applied before or after weeds emerge, depending on the particular herbicide used. Some herbicides are effective only as pre-emergents, others only as post-emergents, and some are effective both ways.

Pre-emergence herbicides kill the weeds in the seedling state; that is, as the seeds germinate, as the seedlings push their way upward through the soil toward the soil surface, or shortly after emergence from the soil.

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emergence herbicides include early weed control and control of certain weed species not susceptible to post-emergence herbicides.

Pre-emergence turfgrass herbicides have limitations: they usually have little or no post-emergence activity; they do not control established perennial weed species; their residues from applications to control winter annual grass weeds in dormant Bermudagrass turf may be phytotoxic to overseeded cool-season turfgrass species; they must be leached downward in the soil to the weed seed germination zone, usually within the upper one-half inch soil layer. Sometimes, pre-emergence herbicides are lost in the turf thatch and unavailable for weed control.

Examples of pre-emergence herbicides include benefin, bensulide, DCPA, ethofumesate, napropamide, oxadiazon, oryzalin, pendimethalin, prodiamine, siduron and trifluralin.

Post-emergence herbicides are applied directly to the aboveground shoot of actively growing weeds, with the leaves the primary target. During application, post-emergence herbicides are also, unavoidably, applied to the turfgrass foliage, except when applied over dormant warm-season species such as Bermudagrass. Thus to avoid turfgrass injury, the turfgrass itself must be tolerant to the applied herbicide.

Examples of post-emergence herbicides include bentazon, bromoxynil, dicamba, DSMA, fenoxaprop-ethyl, MSMA, paraquat and the phenoxy herbicides 2,4-D, dichlorprop, MCPA and mecoprop.

Contact or systemic?

Post-emergence herbicides are either contact or systemic. Contact herbicides are those that undergo little or no translocation in plants. They are most effective in the control of seedling weeds (broadleaf and/or grass) less than two inches tall.

Advantages of contact herbicides are their relatively quick kill (within hours to a few days), less damage to desired plants in the event of slight spray drift onto these plants during application and no persistent herbicid soil residues. Characteristics that may be considered disadvantageous are the lack of soil persistence (thus, failure to control later emerging weeds) and, since they do not translocate in plants, poor control of established perennial weeds and large established annuals.

Examples of contact turfgrass herbicides are bentazon, bromoxynil and paraquat (for dormant Bermudagrass).

Systemic herbicides translocate (move) within plants from their sites of absorption to their sites of phytotoxicity. Foliar-applied systemic herbicides are transported from the leaves, along with the sugars manufactured during photosynthesis, to other parts of the shoot and to underground plant parts.

The principal advantage of systemic herbicides is that they will move within plants to their sites of phytotoxicity. Thus, complete coverage of the targeted weeds is not as important with systemic herbicides as it is with contact herbicides. Systemic herbicides are used to control seedling and established annual and perennial weeds.

A disadvantage of systemic herbicides is that care must be taken during application to avoid contact of the herbicides with susceptible desired plants, as they will also translocate within these plants from sites of contact and absorption to sites of phytotoxicity. A soil-applied systemic herbicide may be root absorbed and transported upward into the shoot. This can pose a problem when a selective post-emergence systemic herbicide is leached into the soil and subsequently root absorbed and transported to sites of phytotoxicity in aboveground parts of susceptible desired plants. Problems have arisen in this manner following applications of 2,4-D and dicamba.

Examples of systemic turfgrass herbicides are dicamba, DSMA, glyphosate, MSMA and the phenoxy herbicides 2,4-D, dichlorporp, MCPA and mecoprop.

Volatility

From a practical viewpoint, turfgrass herbicides are non-volatile, with a few exceptions.

Ester forms of 2,4-D are volatile, and their vapors pose a potential hazard to nearby susceptible ornamentals. The high volatile esters (methyl, ethyl, propyl, isopropyl and butyl) of 2,4-D volatilize at temperatures above 65° F. and, to avoid injury to desired plants via vapor drift, they should not be used in turfgrass.

The low volatile esters (butoxyethyl, isooctyl and others) of 2,4-D volatilize at temperatures above 95° F.. Their vapors pose a hazard to susceptible ornamentals and this hazard should be considered prior to their use in turf areas.

A few pre-emergence herbicides volatilize, but their vapors rarely have post-emergence activity, and they pose little or no threat to established ornamentals. However, unless leached into the soil soon after application by rainfall or irrigation, such herbicides may be lost from soil and turf surfaces, with a corresponding loss in weed control.

Formulations

Herbicides are sold to the consumer as formulated products. Thus, the product in the paper, plastic or glass container is a formulation, with the herbicide as its active ingredient.

Turfgrass herbicide formulations are of two basic types: (1) granules or pellets that are applied directly (not mixed with water) to the turf, and (2) those designed to be pre-mixed (diluted) with water and applied in aqueous sprays.

Granular or pelleted formulations contain pre-emergence herbicides; they are not intended for foliar absorption. Pre-emergence herbicides are also formulated to be applied in aqueous sprays. All post-emergence turfgrass herbicides are formulated to be pre-mixed with water and applied in aqueous sprays.

Water-diluted formulations include emulsifiable concentrates, wettable powders, liquid and dry flowables, and those that contain water-soluble herbicides, such as DSMA, MSMA, glyphosate and salt forms of the phenoxy herbicides.

Water

Rainfall and irrigation can influence the effectiveness of turfgrass herbicides. Water encourages weed seed germination and seedling emergence. Water enhances the activity of pre-emergence herbicides, moving the herbicides into the zone of weed seed germination and seedling emergence.

In general, weed control is enhanced by one-half inch of rainfall or irrigation following soon after application of pre-emergence herbicides. Too much water may leach the herbicides too deeply in the soil, resulting in poor weed control.

Foliar-applied herbicides are often so quickly absorbed that they are not adversely affected by rainfall occurring 30 minutes or so after application. A few foliar-applied herbicides, especially water-soluble ones, may be partially washed from foliage by rainfall occurring soon after application, resulting in reduced phytotoxicity. **LM**

W. Powell Anderson has been a faculty member in the Department of Agronomy at New Mexico State University for 25 years. He is now retired, but still teaches two weed science courses with the academic title of Associate Professor Emeritus. Anderson is author of the textbook "Weed Science: Principles."

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Circle No. 127 on Reader Inquiry Card

PART I OF II

MANAGEMENT CALENDAR: COOL-SEASON ATHLETIC FIELDS

Quality turf can make athletic fields safer for young athletes. Field managers should follow this general guide for safer turf.

by J. R. Hall III, Ph.D., Virginia Tech

Frequent evaluation of current athletic field management programs is important. Setting up annual management calendars helps increase administrative decision-making and personnel management decision-making efficiency.

Calendars let the professional plan ahead for equipment and material purchasing needs, as well as program seasonal labor needs. A generalized management scheme has been outlined for Kentucky bluegrass and tall fescue athletic fields to provide a basic outline for this planning process.

Specific dates, intensity and frequency of practices will vary with geographic location, traffic demands and facility resources.

January-February

The first step toward safer athletic turf is to begin the year with a soil test. Do this as soon as the ground is not frozen. Collect soil samples from the field from a zero to three-inch depth. Combine 20 to 30 core samples in a bucket to make up a single sample for each field.

The next step is to fill low spots. Surface drainage will improve by filling low spots or regrading fields with good topsoil. Let the soil settle for two to three weeks prior to repair. This will allow time for a few soaking rainfalls to aggregate the new soil. Install internal drainage where needed.

Finally, plan ahead for the months to come. Do this by observing the field for winter disease activity and winter annual weed invasion. Determine the need for renovation and order seed, sod, fertilizer and pesticides. Line up equipment and personnel needed for the year.

March-April

Mowing will become necessary in these spring months. Begin mowing as soon as turf height exceeds the mowing height by one third. For instance, if your mowing height is two inches, begin mowing at 2 2/3 inches. Always use sharp mowers.

Keep the mowers sharp, since dull mowers injure turf, increasing water use and wasting stored food reserves.

Aerify the field using a core aerifier. Make at least two passes to alleviate compaction. Use the 3/4-inch diameter tines. Break up cores with chain link fence or chain drag. Time the aeration during a period of rapid foliage growth to minimize weed invasion and to mimimize the time the field shows aeration damage.

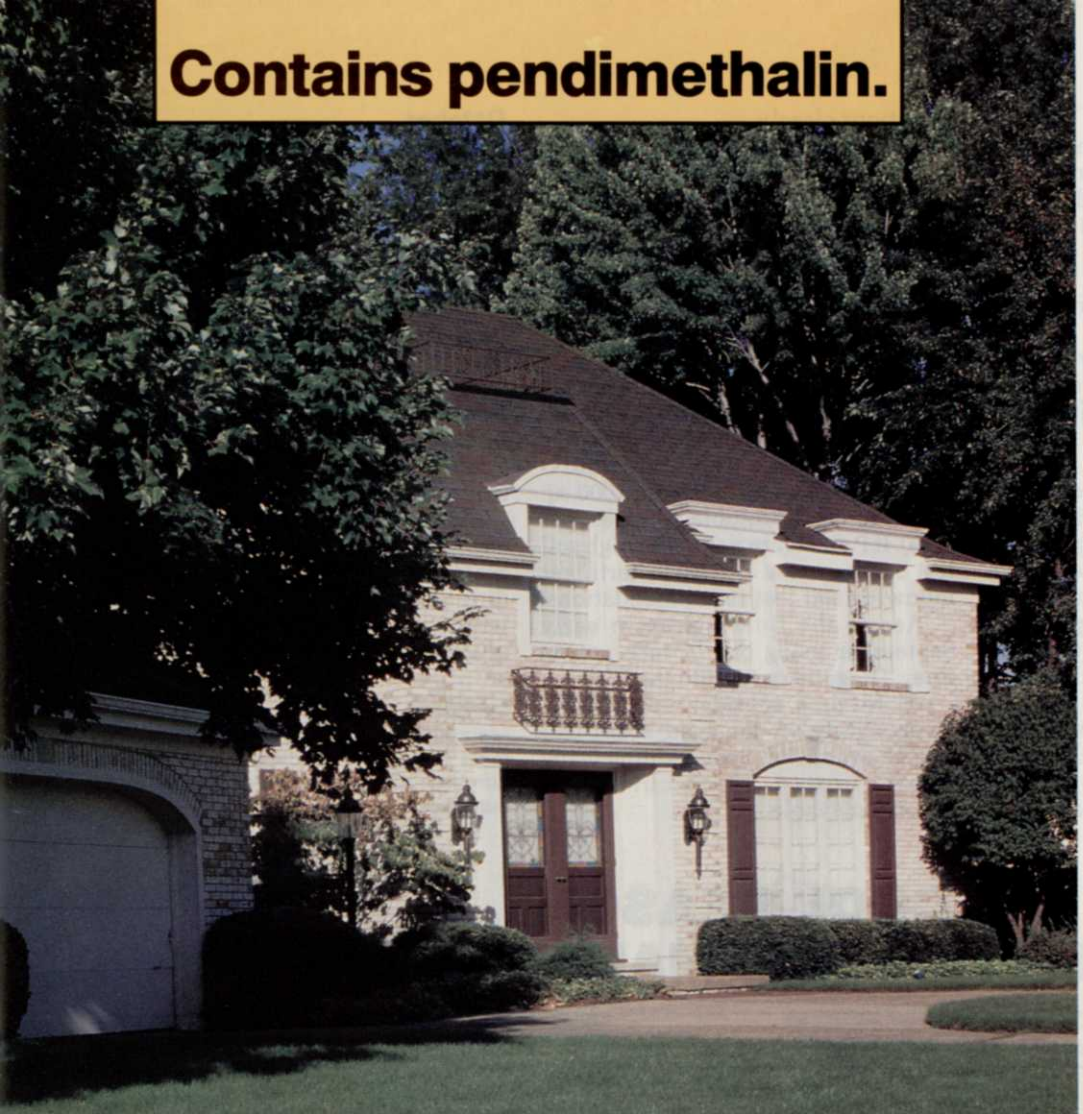
The next move is to apply pre-emergence herbicides. If crabgrass has been a problem in the past, use a pre-emergence herbicide such as benefin, bensulide, dacthal, napropamide, oxadiazon, pendimethalin or siduron. If goosegrass has been a serious problem, consider using oxadiazon. If early season seeding and crabgrass control are going to be necessary, use siduron.

May

Aerification is still important in late spring. Heavily-trafficked fields may benefit from light aerification in this time frame while the grass has healing potential.

Next, identify the weed and select the most effective herbicide for control. Consider the following alone or in combination: 2,4-D, MCPP (mecoprop), 2,4-DP (dichlorprop), dicamba or triclopyr. Follow label directions closely.

Fertilizing should be done lightly. Apply the equivalent of 0.5 lb. soluble nitrogen per 1000 sq. ft. (22 lb. nitrogen per acre). This can come from various sources of nitrogen. Irrigation after application is generally beneficial.



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June-August

Heavily-trafficked fields should be lightly aerified again in early June. Make two passes with 3/4-inch diameter tines. Drag the cores into the surface with a chain link fence or chain drag.

Schedule mowing regularly so no more than one-third of the existing grass blade is being removed with each mowing. Keep the mowers sharp, since dull mowers injure turf, increasing water use and wasting stored food reserves.

Irrigate the field as necessary. Water infrequently, but heavily when you do. Early morning irrigation (4 a.m. to 10 a.m.) is the most effective and beneficial. Time irrigation to avoid traffic on wet fields, if possible. In the summer it's important to watch for disease, particularly on tall fescue and perennial ryegrass fields. Rhizoctonia brown patch is the most prevalent and is effectively controlled with Bayleton 25WP, Chipco 26019, Daconil 2787 or Dyrene. Follow label directions closely.

In late August, it's important to spot-seed or sod-patch thin areas. Light surface disruption with a three-pronged rake is desirable prior to establishment. Lightly foot-trample the seeded or sodded areas to assure seed and sod to soil contact.

September

Fertilize according to the soil sample recommendations. If phosphorus (P) and potassium (K) levels are high, use straight nitrogen. Apply the equivalent of 1.0 lb. of nitrogen per 1000 sq. ft. (40 to 50 lb. soluble nitrogen per acre). If P and K are not in the high soil test range, use a complete fertilizer following soil test recommendations.

Aerate the field lightly in early September using the 3/4-inch coring tines. Drag the cores into the turf.

At this time, consider repair needs. Overseeding of damaged areas can still be beneficial. Spot-sodding using tightly-butted, thick-cut sod is quickly playable.

October

Fertilize by following the September procedure.

Consider the need for broadleaf weed control. Winter annuals germinate in the fall and are most effectively controlled in this time frame. If herbicides are necessary, apply them in strict accordance with the label instructions.

November-December

In November, fertilize following the September procedure. In December, consider the repair needs.

After the last game, evaluate the damage to the field and decide on the reasonable methods of repair. If sodding is a possibility, it is best done with cool-season grasses at this time to allow maximum rooting. **LM**

Mention of specific products in this sample program does not imply exclusive endorsement of any one product. It was done to simplify the program for educational purposes.

COOL-SEASON ATHLETIC FIELD MANAGEMENT

	JANUARY FEBRUARY	MARCH APRIL	MAY	JUNE JULY AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
AERATE		Use coring aerifier. Make at least two passes.	Light aerification.	Light aerification in early June.	Aerate lightly			
DISEASE CONTROL				Watch for disease and treat as necessary.				
FERTILIZE			Fertilize lightly.		Fertilize: follow soil test recommendations.	Follow Sept. procedure	Follow Sept. procedure	
IRRIGATE				As needed. Infrequently, but heavy when you do.				
MOW		Begin mowing as soon as turf height exceeds mowing height by 1/3rd		Regularly.				
REPAIR	Fill in low spots to improve surface drainage.				Consider repair needs.			Consider repair needs.
RENOVATE	Determine need for renovation and order seed, sod, fertilizer pesticides.							
SEED/SOD				Spot seed or sod in late August.				
SOIL	Test soil as soon as the ground is not frozen.							
WEED CONTROL		Apply pre-emergence herbicides.	Control broadleaf weeds.			Consider broadleaf weed control.		

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On Design

THE ULTIMATE

by Heide Aungst, managing editor

The course may have a strange name—Teeth of the Dog—but it's a classic in the world of golf. Teeth of the Dog is the only course in the world to have seven complete holes on an ocean. Built in 1970, the Pete Dye creation is the highlight of the Casa de Compo Resort in the Dominican Republic. "*Golf* magazine rated it 29th in the world," Dye says. "It's one of the first courses built since 1960 to crack into that group." Other courses making the list include old-time clubs like Pine Valley.

Golfers enjoy a panoramic view of the Carribean while playing at the Teeth of the Dog. The No. 7 hole on the South green, pictured here, is only four feet above sea level. A crew of 24 cares for the course year-round. The crew mows the 6500-square-foot Tifdwarf Bermudagrass South green daily at ⅛ of an inch. "Because of the proximity to the sea, management has to be continuous," Dye explains. "They syringe twice a day to keep the salt content down. Because of the syringing practices, the greens are fertilized every week to 10 days with a high sulfate fertilizer because of the salt intrusion."

The crew aerates the greens up to four times during the summer "off-season." Off-season play consists of about 80 rounds of golf. That number skyrockets to about 180 during the winter. The low humidity of the area keeps disease to a minimum.

The young course is already packed with history. In 1974, the Teeth of the Dog hosted the prestigious World Amateur Team Championship, with 40 participating countries. In 1978, Hurricane David damaged the No. 7 hole, closing it down. But after minor repairs, it opened three weeks later, matching the original design.

Dye says he has no plans to alter the design in the future. "I've always had a keen feeling about this course...a love affair," Dye says. "You'll never be able to have seven holes on the sea anywhere else."

GREEN

Photo by Tom Doak

PART II OF IV

TURFGRASS DROUGHT RESISTANCE

Turfgrass managers need to understand the difference between water stress and drought stress. In the second part of LANDSCAPE MANAGEMENT's four-part water series, we look at what it takes for plants to adapt to drought.

by Jeff Nus, Ph.D., Kansas State University

To gain understanding of drought resistance in plants, turfgrass managers must realize that no single factor is responsible for drought resistance. It is certainly a combination of factors that enables plants to survive conditions dry enough to kill other plants which do not have these characteristics.

An important issue in understanding drought resistance is to differentiate between drought and water stress. Drought is a meteorological term. It is defined as an extended period of low rainfall.

Water stress refers directly to the plant and occurs to varying degrees throughout the plant's life. Drought is always accompanied by plant water stress, but water stress may occur even when soil moisture is plentiful.

One definition of water stress—a lowering of the water potential—means that less energy is held within the tissue water due to a loss in turgor pressure or a concentration of solutes in the plant cells. Solutes become concentrated due to a decrease in water content or an active accumulation from the soil solution. Research has shown a day/night (diurnal) fluctuation in turgor and water potentials in Kentucky bluegrass (Table 1).

As plants develop more severe water stress (lower turgor and water potentials) during the afternoon hours, they are able to regain their water status—more positive turgor and water potentials—at night when conditions are less favorable for water loss. However, during drought stress, turgor and water potentials may only recover partially in the dark because soil moisture normally used to replace tissue water lost via transpiration simply isn't there in sufficient amounts. As a result, plant water stress increases as a drought continues.

Drought's damage

Drought affects the morphology or appearance of plants, especially the way plants grow. For example, leaves that develop during drought stress have thicker cuticles and fewer stomata. This growth pattern reduces the rate of water loss from the leaves and conserves plant and soil moisture.

During prolonged water stress, large cells collapse, resulting in leaf folding of most cool-season grasses and leaf rolling of warm-season grasses.

In addition, older leaves die, drop from the plant and contribute a mulch to the soil. Leaf senescence and death is accelerated by severe water stress. The remaining turfgrass leaves fold or roll up depending on action of cells located near the leaf midrib.

During prolonged water stress, these large cells collapse, resulting in leaf folding of most cool-season grasses (most fescues, bluegrasses, ryegrasses) and leaf rolling of warm-season grasses (Bermudagrass, St. Augustinegrass, centipedegrass and zoysiagrass). This reduces leaf area, so both radiative heat load and transpiring leaf surface are reduced. The net effect is moisture conservation.

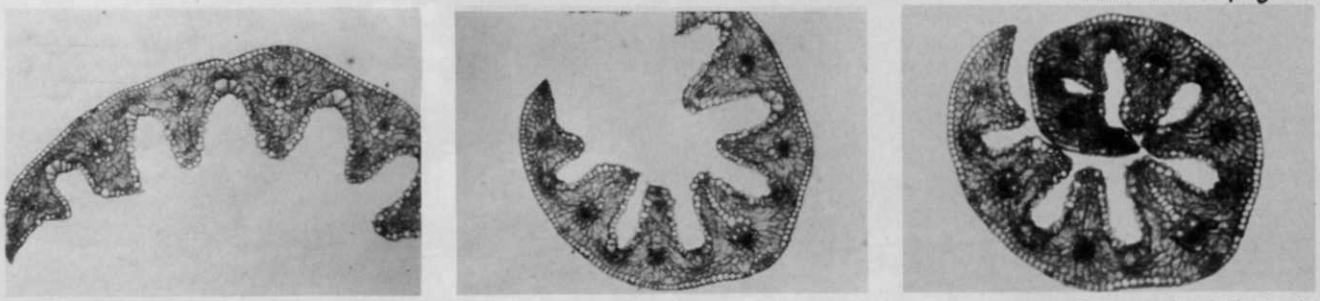
Drought also influences delivery of photosynthates to the leaves, roots, tillers and rhizomes. Root-to-shoot ratios have been used to evaluate drought-resistant plants, because plants with higher root-to-shoot ratios are often more drought resistant. In addition, root-to-shoot ratios of plants increase during drought stress. This also is true of turfgrasses and is due to the differential sensitivities to water stress of different fractions of the plants. Research has shown that tillers and rhizomes are very sensitive to prolonged water stress (Table 1). This sensitivity accounts for much of the increase in root-to-shoot ratios of Kentucky bluegrass during drought.

Plants can be divided into three general categories concerning mechanisms of drought resistance. Those that:

1. escape drought;

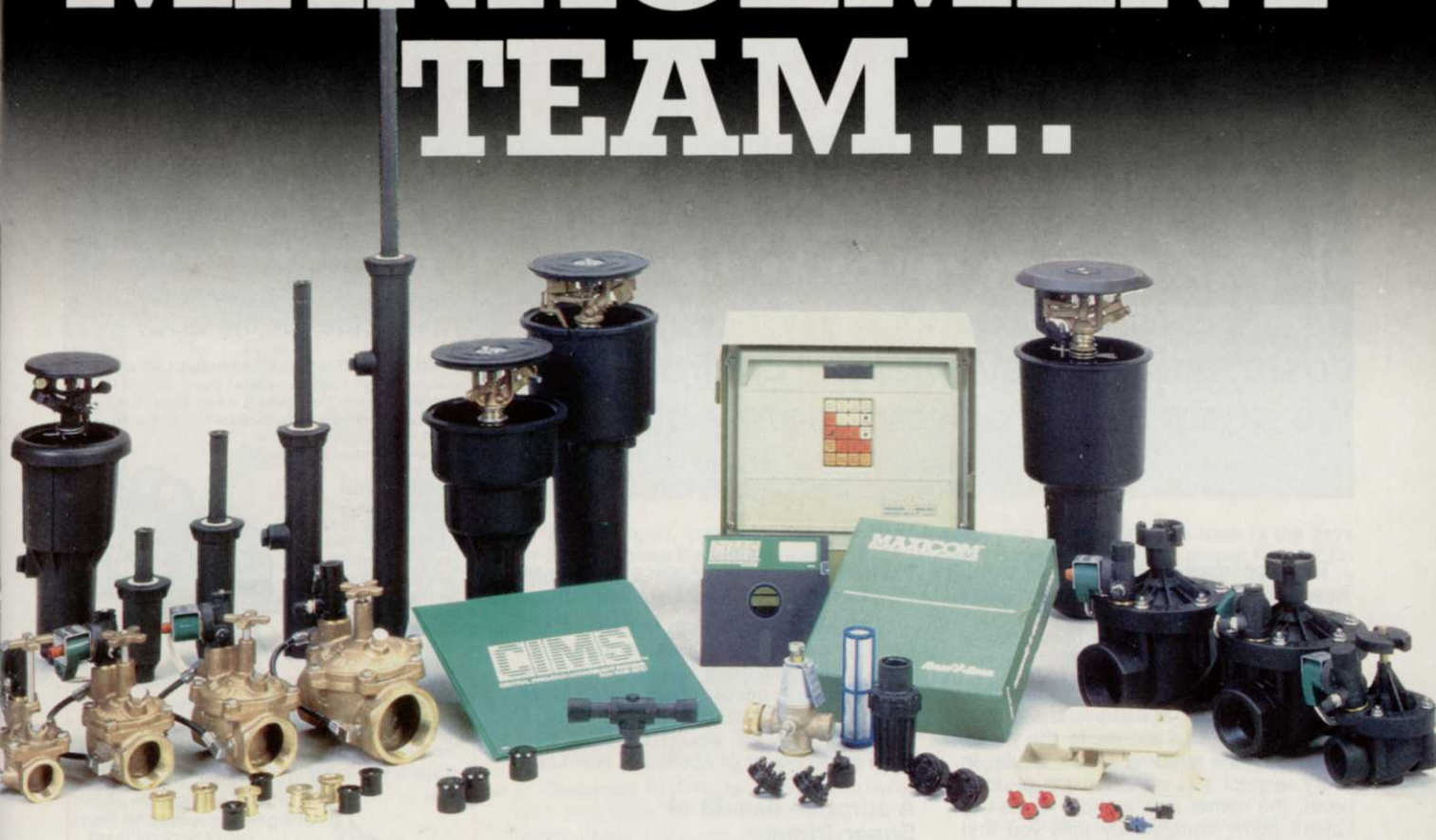
2. avoid drought with high tissue water potential; and

continued on page 36



Turfgrass has developed water conservation mechanisms. Shown here is a cross-section of a tall fescue leaf blade (A).) with ridged upper surface and smooth under surface; (B) as moisture stress occurs, the leaf begins to roll; and (C) the final response, a tightly rolled leaf blade with the upper surface being protected to minimize water loss.

THE WATER MANAGEMENT TEAM...



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Everett Mealman, President
PBI/Gordon Corporation

The experience of Greenscape Lawn & Tree of St. Louis is typical of what you can expect when you use Super Trimec as your broadcast post-emergence herbicide for your first treatment of the year.

Greenscape is a quality-oriented lawn care company in Manchester, Missouri where it has easy access to the prestigious western suburbs of St. Louis. In every respect it is an extension of John Loyet, the owner and founder. A visit to Loyet's home immediately tells you that his vocation and his hobby are one and the same. His lawn is absolutely as immaculate and pristine as any ornamental turf you will ever find, as is evident from the picture on the opposite page.

The Greenscape program is based on rifle-shot care. They use granular fertilizer and handle all treatments on an individual basis of need rather than on a shotgun-type production-line schedule. They keep an eye on all of their lawns, and make it a point to be acquainted with their customers.

"For several years we've been using Trimec Applicator Formula," says Loyet, "and we've been extremely well pleased with its weed control. But the promises PBI/Gordon makes for Super Trimec are mighty hard to ignore, so in 1987 we decided to start earlier than usual and use Super Trimec in our first treatment, and then switch to Trimec Applicator Formula when the hot weather hit.

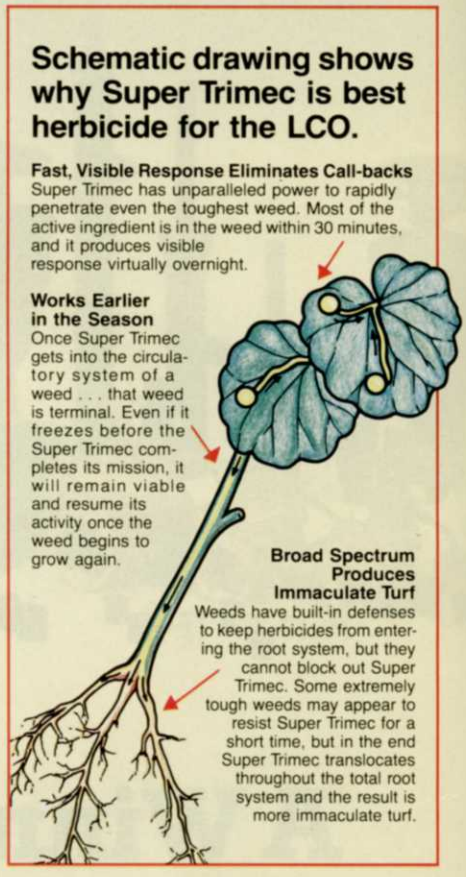
"The weed control from the early treatment of Super Trimec was so thorough," says Loyet, "that many of our lawns never did require a second broadcast. Spot treatment was more than adequate. As a matter of fact, we wound up 1987 with quite a carry-over of Applicator Formula."

A surprise benefit of Super Trimec

Loyet goes on to say that his customers were very pleased with the weed control of Super Trimec, and of course he was more than pleased that he was able to start earlier in the season and thus handle more customers.

"But there's another very important dimension to this," says Loyet. "Because of the way we do business, we have a chance to visit with many of our customers, and we notice they are very knowledgeable and concerned about environmental affairs. They recognize the need for pesticides, but they want to use only as much as is really needed. When we tell them that the amount of Super Trimec we use on the average lawn contains less than an ounce of 2,4-D and is biodegradable, we get very positive feedback, and we know from direct experience that they pass the good news on to their friends and neighbors."

Schematic drawing shows why Super Trimec is best herbicide for the LCO.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Weeds have built-in defenses to keep herbicides from entering the root system, but they cannot block out Super Trimec. Some extremely tough weeds may appear to resist Super Trimec for a short time, but in the end Super Trimec translocates throughout the total root system and the result is more immaculate turf.

Facts turf pros should know about Super Trimec

Super Trimec is a remarkable breakthrough in herbicide chemistry. To make it, we combine several esters with dicamba in a synergistic and homogenous complex in which every droplet is an exact mirror image of the total. No one except PBI/Gordon has ever been able to do this.

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SUPER

John Loyet (right), owner of Greenscape Lawn & Tree, shows Everett Mealman the job that Super Trimec has done on his own lawn. INSET: The Irish Leprechaun that Greenscape uses as a symbol. It dates back to the days when Loyet's grandfather played football for Notre Dame's Fighting Irish. Today it is Greenscape's promise of Emerald Isle green.

The esters have unparalleled penetrating power, which enables the complex to get through the cuticle and into the circulatory system of even the toughest weeds within 15 to 30 minutes. And once Super Trimec gets into a weed . . . that weed is terminal . . . period!

But please note: the dicamba in Super Trimec is in acid form and is virtually insoluble in water. Therefore it will not migrate in soil and endanger off-target ornamentals.

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2) **Eliminates call-backs:** Super Trimec produces quick, visible response. Your customers *see* that it is working, so they stay off the telephone.

3) **Reduces herbicide costs:** You use less herbicide per acre and you spray fewer times per year. Both your weed control *and* your profits are better.

4) **Your customers become your salesmen:** They tell their friends and neighbors about the quality of your work and your friendliness to the environment.

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Yes, Super Trimec is a low-volatile ester. Yes, Super Trimec is labeled for professional use only. But you *are* a professional. Utilize your professionalism to increase your profits.

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TURF HERBICIDE

Circle No. 140 on Reader Inquiry Card

WATER *from page 32*

3. tolerate drought with low tissue water potential.

Escaping drought

Plants that escape drought are plants like annuals that can germinate quickly and complete their life cycles (seed-to-seed) before the onset of drought. The plants escape drought by surviving those periods of little rainfall as seeds. Many desert annuals have evolved the escape strategy for drought resistance.

In some ways, *Poa annua* (annual bluegrass) is like that. It germinates during the fall when there is plenty of moisture. It sets seed profusely during late spring and early summer, before severe water stress occurs. During hot, dry summer months, poa growing under unirrigated conditions may be severely thinned because the plant itself has little drought tolerance.

However, the survival of annual bluegrass is assured because its life cycle is completed, seed is produced, and it germinates when the conditions are again favorable in the fall. It should be kept in mind that poa exhibits a great deal of genetic diversity.

The growth habits of poa range from tufted, bunch-type annuals to perennial, prostrate creeping types. This diversity in growth habit suggests that annual bluegrasses may differ widely in the level of drought resistance.

Avoiding drought

The second general strategy of drought resistance is avoidance. Plants that avoid water loss during prolonged water stress by maintaining high water potentials (high content of relatively pure water) are classified as being drought avoidant. These are plants that most people associate with arid environments like cacti and spurges.

Drought-avoidant plants have very efficient means of rapidly absorbing water when it is available and have growth characteristics that inhibit water loss. These plants are characterized by thick, fleshy plant parts, very thick cuticles, suberized roots, low surface-to-volume ratios, and a system of photosynthesis which allows them to close their stomates during the day when evaporative demand is very high.

It is important to realize the nature of various adaptive features of these plants because some of these features may represent selection criteria for turfgrass breeders whose goals are to improve drought-resistant turfgrass.

Tolerating drought

The third general category of drought resistance includes plants that tolerate drought at low tissue water potentials (low content of relatively concentrated water). Many turfgrasses belong to this group. Plants belonging to this group react to prolonged water stress by making their tissue water quite concentrated with various salts, sugars and organic acids. This adaptation greatly increases the plant's ability to take up water. So, although there is less water available in the soil, the ability to extract that water is increased.

TABLE 1.

Relative growth of Merion Kentucky bluegrass subjected to increasing drought.

PLANT PART	RELATIVE PLANT GROWTH (%) OSMOTIC PRESSURE LOW	MODERATE	HIGH
Whole Plant	100*	52	29
Leaves	100	65	49
Roots	100	65	43
Tillers	100	41	12
Rhizomes	100	32	7

*Values are percentages of growth in low osmotic pressure or drought stress conditions.

Osmotic adjustment

The process of extracting water is called osmotic adjustment and serves an important purpose. Plants which can osmotically adjust can maintain turgor pressure to some degree. This is important, since turgor pressure is the driving force for cell expansion and plant growth. By maintaining turgor pressure, turfgrass roots can continue to grow and extract additional soil moisture. In addition, leaves can grow, increasing photosynthetic capacity, and stomates can stay open in the light when turgor is maintained. When stomates are open, evaporative cooling keeps the leaves from overheating. If osmotic adjustment does not maintain turgor, stomates close rapidly and turfgrass leaves soon overheat.

Several agronomically important grasses have been shown to have capacity for osmotic adjustment, including corn, sorghum, wheat and rice. Turfgrass research at Iowa State University demonstrated that Kentucky bluegrass can osmotically adjust under simulated drought stress conditions.

The recent interest in osmotic adjustment in response to water stress should not lead to false hope. It must be remembered that drought resistance is the result of many plant characteristics.

Osmotic adjustment is a process that may provide valuable insight in the development of drought-resistant turfgrasses. But it is only one process in many that deserves attention.

In addition, research has shown that the capacity of osmotic adjustment is clearly limited. That is, even plants with the greatest capacity for osmotic adjustment have a point at which it is useless to develop drought resistance because of high water needs.

Research at Kansas State University is investigating the relationship between water use requirement and capacity for osmotic adjustment in several Kentucky bluegrass cultivars. It is hoped that this research will yield information helpful to the development of drought-resistant turfgrasses.

Until more basic knowledge concerning drought resistance in turfgrasses is gained, however, performance of turf during drought is solely dependent upon the turfgrass manager's expertise.

Turf management

Management techniques have centered around the need to conserve water. They include limiting nitrogen use prior to drought's onset, tensiometer-controlled irrigation, and using wetting agents to improve wetting uniformity of the soil. Although these management strategies are certainly valuable, long range success may depend primarily on using drought-resistant species and cultivars.

Turfgrass species and cultivars that exhibit superior drought resistance and recuperative potential offer the best hope of ensuring quality turfgrass under non-irrigated conditions. It is gratifying to see that much recent turfgrass research is being conducted with this goal in mind. **LM**

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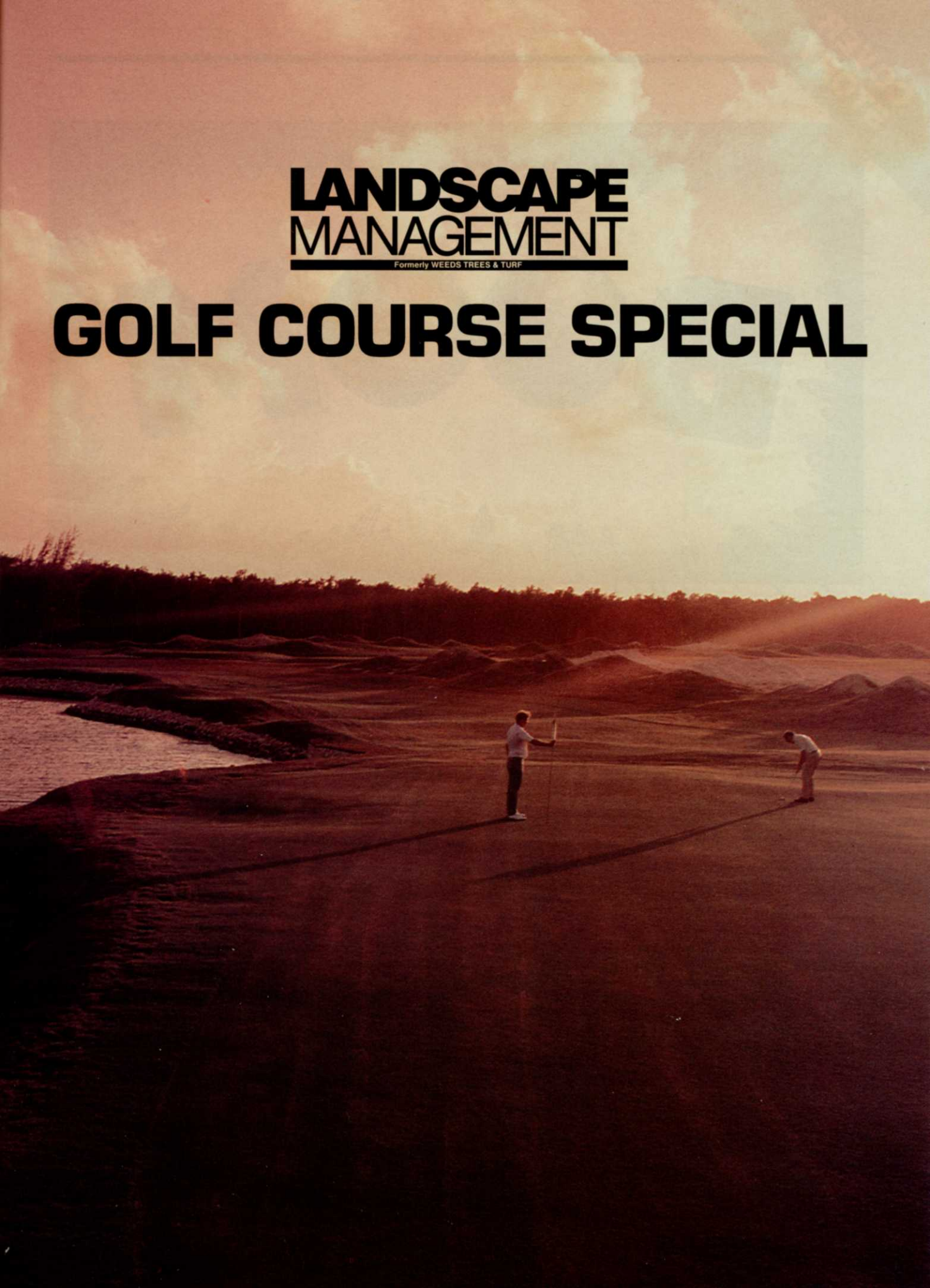

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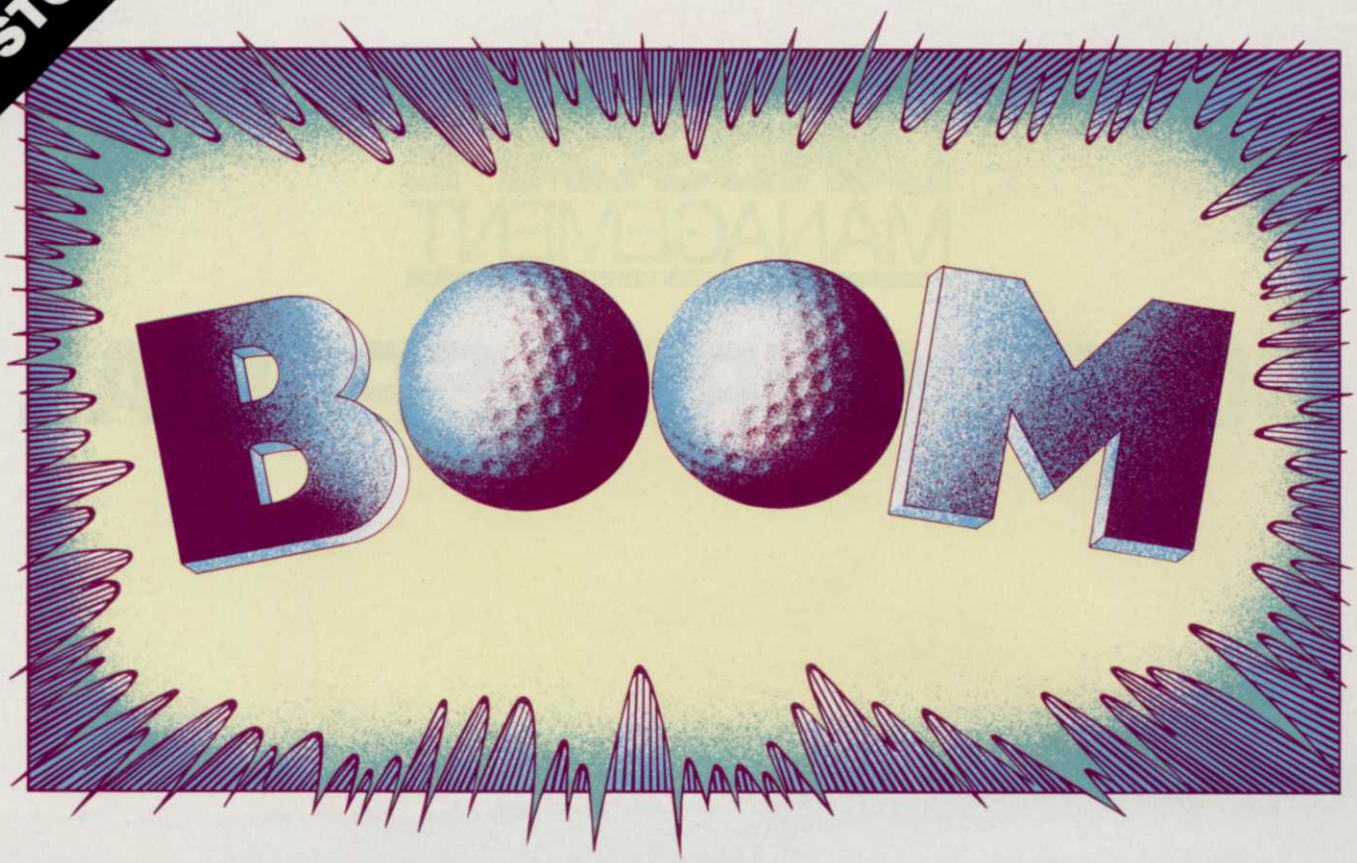

Golf course construction has reached new heights. Competition increases among golf courses to attract golfers. And that means more pressure on superintendents. It may not be the shot heard 'round the world, but it's being heard in the U.S.

by Jerry Roche, editor

Golf booms.

A record number of golf courses are in the planning stages, under construction or recently-completed, according to statistics from the National Golf Foundation. The NGF has determined that 102 new facilities were expected to open last year, 275 were under construction and 224 were being planned. More than 100 of those have opened or will open in Florida, America's favorite retirement state.

Many reasons exist for why golf booms. One of the most obvious is that post-war baby boomers are reaching ages where they are settling down to less strenuous athletic endeavors, and golf fills the bill. The NGF says that 20.2 million Americans golf today. The organization also theorizes that in 13 years, it could be 30 million to 40 million.

Robert Adams, Ph.D., of the University of New Hampshire, recently predicted "a coming crisis in golf course availability." Adams, speaking at an NGF event, said that the crisis would be the result of:

- the current inadequacy in golf course supply;
- the recent downturn in public course construction; and
- the projected significant increases in demand for golf.

Travel, too, to recreational havens like North and South Carolina is increasing. The World Tourism Organization, a division of the United Nations based in Madrid, predicts travel will be the world's largest industry by the year 2000.

"There's a sizeable market of people willing to pay top dollar for a non-plastic, uncrowded experience," says Donald Holecek of the Michigan Travel, Tourism and Recreation Resources Center. "What a lot of people need is to get away from the computer terminal and TV, and get back to situations they can control."

And—again—golf certainly fills the bill.

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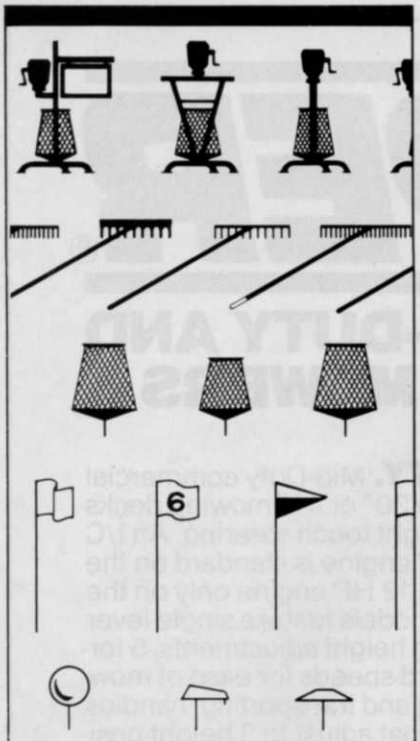

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the value of a golf course as a recreational facility for its residents, an attractive green belt, and as a magnet for tourists, golf course development will continue to boom," says Roger Rulevich, president of the American Society of Golf Course Architects.

Yet the increased number of courses and cries from the public for increasingly higher maintenance have placed a greater pressure on golf course superintendents: pressure to use more sophisticated chemicals, equipment and seed.

"The trend toward more play on golf courses will challenge the most sophisticated superintendent," says Don Parsons of Old Ranch Country Club in Seal Beach, Calif. "Our technology is increasing at a phenomenal rate, (but) there always seem to be new problems that rear their ugly heads."

Golf vs. EPA

One recent problem superintendents face is a more critical look at golf course pesticides by the Environmental Protection Agency.

"A large portion of our most effective chemicals have been taken off the market; some rightfully so, some not," wrote Reed LeFebvre of Plant City (Fla.) Golf & Country Club in *The Florida Green*. "We don't have the answers right now, but we are working hard to find them."

LeFebvre, president of the Florida Golf Course Superintendents Association, pointed out these figures:

- In 1977, it cost $25 to $50 per acre to treat a course for nematodes;
- In 1987, it costs up to $300 an acre to treat a course for nematodes;
- Treatment for mole crickets (a big problem in Florida) this year cost his golf course $400 to $800, depending on which rate was used.

And the problem could get worse before it gets better.

Black layer

Anaerobic black layer has taken the golf industry by storm. Every day, reports come in about another course that has developed this black layer that kills greens.

Many hypotheses have been put forth on the cause.

Michigan State suggests that the layer is made up of insoluble precipitates formed by the reaction of hydrogen sulfide with metal ions. The hydrogen sulfide is produced by anaerobic bacteria that live under high moisture conditions.

Iowa State believes that algae and their muscilagenous by-products cause poor water infiltration, thus causing the anaerobic material.

No matter its cause, attempts are being made to find acceptable solutions through university research. Until such solutions are found, superintendents cannot rest easy.

Technology

The introduction of new bentgrasses to the seed market is an indication of increased need for more material to handle more golfers. In the recent past, it has been extremely difficult to obtain bentgrass seed, so the seed industry is answering the superintendent's call.

Spurred by wholesome competition, equipment-makers continually improve their products. Despite more restrictions imposed by the EPA, chemical companies continue to release new, better pesticides. Last year, the newest control product—Triumph insecticide—received the EPA's official blessing.

The increased number of courses and cries from the public for increasingly higher maintenance have placed a greater pressure on golf course superintendents.

Infrared thermometers that can read the drought stress level of turf have hit the market. Michigan State has developed a set of disease models that are very accurate at predicting the possible introduction of pathogens in turf. Some disease testing kits have been marketed recently.

And university research is creating options to chemical control. In recent years, insect-resistant endophytes have been found in certain grasses, decreasing the need for pesticide use. Biological control for annual bluegrass is being worked on at Michigan State (see Research Update page 92).

"Biotechnology is on the cutting edge of new discoveries. They are developing plants that are disease and insect resistant," says Parsons. "They may be none too soon. The pesticide restrictions and regulations are absolutely scary. The ability to make adjustments will be essential as we continue to experience more restrictive environmental restraints."

The outlook for golf course superintendent-ing, then, is bright, despite some problems. The future looks both exciting and challenging. **LM**

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THE MAKING OF A GREAT COURSE

Old Marsh Golf Club used to be a cattle ranch located on wetlands. Scheduled to open last month, the Pete Dye creation is now one of Florida's finest.

It is a rare gray morning on the back nine at Old Marsh Golf Club in North Palm Beach. Golfers are greeted by families of wild sandhill cranes and dense hammocks of tall cypress, sabal palms and pines.

And that's exactly what developer Robert B. Whitley had in mind when he asked Pete Dye to transform a cattle and horse ranch into a championship course.

The 450-acre, 18-hole Old Marsh course was designed by Dye to be unique in Florida because natural prairies were incorporated. The predominantly grassy marshlands provide a natural setting of beauty that ideally lends itself to a Dye creation.

An 11,000-square-foot maintenance facility includes offices, storage space for $350,000 worth of new maintenance equipment, a caddy lounge and a separate, 600-square-foot chemical and soil storage building.

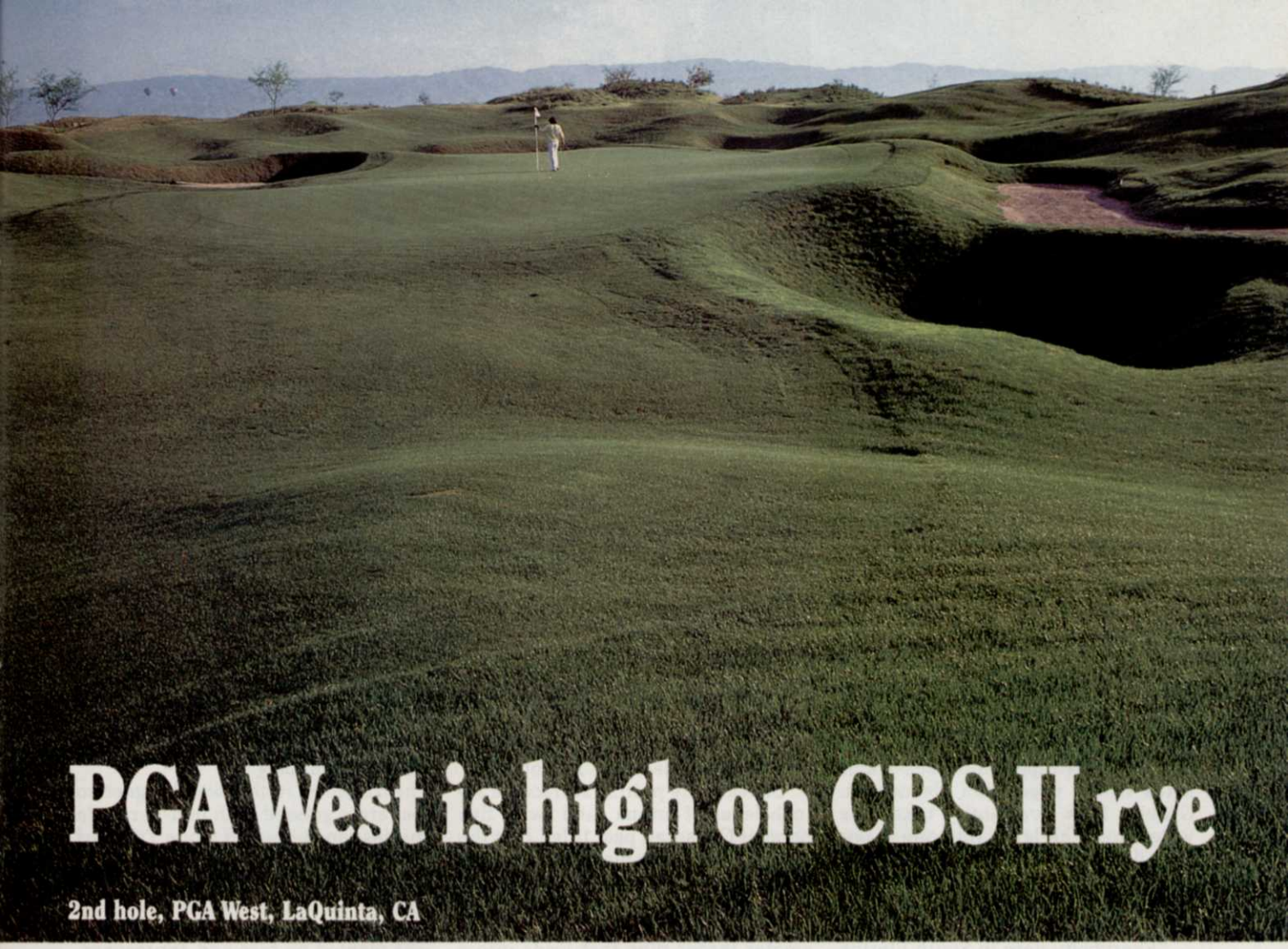
Wooden bulkheads, long a Pete Dye trademark, have been used sparingly. However, boardwalks spanning the marshes and wooden cart bridges have been built throughout the course. Complicated irrigation and drainage systems protect five separate, 18-acre natural Everglades parcels and 30 acres of newly-created marsh from fertilizer and pesticide runoff.

Florida protects wetlands because they are vital for fresh water supply replenishment, flood control and irrigation. Perhaps most importantly, they are feeding grounds for many species of Florida's wading birds. Florida has lost an estimated 12 million acres of wetlands—about 60 percent—between 1850 and 1973, according to state estimates. For this reason, Old Marsh developers spent two years getting all the needed environmental permits before breaking ground. A strict monitoring program has guaranteed protection of the natural wetlands.

Wetting non-wetlands

To irrigate the golf course, Old Marsh chose the Toro Vari-Time II hydraulic system. State regulations allow no irrigation in the wetland areas. There-

Old Marsh superintendent Dennis Weber says the Steiner TRS 20 is "an up-and-coming piece of equipment" for golf courses with steep banks.



PGA West is high on CBS II rye

2nd hole, PGA West, LaQuinta, CA

This Pete Dye designed course uses CBS II blend for uncompromising quality in desert overseeding

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fore, almost every pop-up head that Toro manufactures—including 690s, 670s, 650s, 640s and even Super 600s—had to be used. To pump water through the system, a PSI pump station with 1800 gpm capacity was selected.

The cost of irrigation installation, including materials, labor and pump station was approximately $350,000. Drainage materials and installation cost approximately $225,000, says superintendent Dennis Weber. Very little fill has been used on this unusual course. The greens are generally on the same level as the surrounding trees and vegetation.

"This is my first Pete Dye-designed golf course, and due to the stringent environmental standards, I really got an education from him on the subject of drainage," says Weber. "Almost 50 percent of our construction costs on this course were underground," he adds.

Excess irrigation and rain water flows into an average of 50 drain tile catch basins on each hole. The runoff water is then moved through a series of custom-fit pipes into deep-water lakes where vegetation cleanses it. Gravity flow eventually takes the water from the lakes into one major outfall canal which is force-pumped three miles into the South Florida Management District canal system, says Weber.

"Everybody here in South Florida has problems with draining their greens. But Old Marsh is using a method preferred by Dye that has proven to be effective," he notes.

Shown here is hole No. 5 while under construction. That hole has been made even more difficult by a man-made marsh surrounding it.

Beneath the putting surfaces, a 14-inch layer of ortona sand (with five percent Canadian peat tilled into the top six inches) was placed over a four-inch deep layer of pea gravel. Under the pea gravel, a herringbone drainage field draws the water into six-inch diameter feeder pipe that leads into a 24-inch main line. That line delivers the excess water into the strategically-located lakes.

Old Marsh has five preserved natural wetlands bordering the course.

Bermuda is king

The irrigation system was designed so that areas grassed with non-Bermuda species can be shut off while Tifdwarf on the greens will still be irrigated.

The Tifdwarf greens are overseeded in winter with creeping bentgrass. Tifgreen 328 Bermudagrass was planted on tees and approaches.

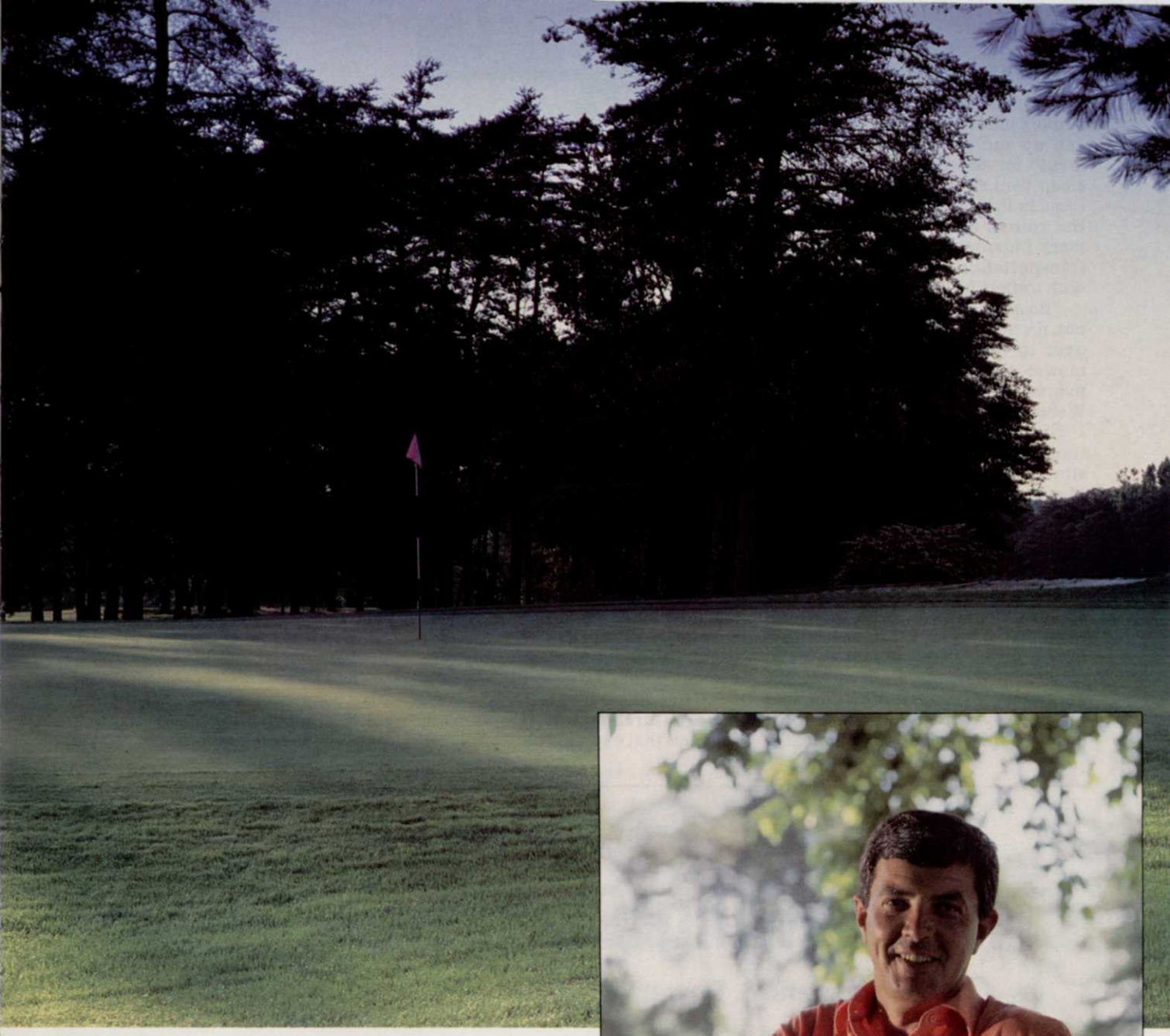
Centipedegrass, carpetgrass and Bahiagrass were chosen for rough areas because of their natural, contrasting appearance. Centipedegrass was sodded onto the pot bunkers and the faces of all steep banks. The full-time maintenance crew will fertilize the roughs only twice per year and cut it only about six times, to retain the natural look of each grass.

Generally, fertigation is the chosen method of feeding. That, however, is supplemented with dry applications broadcasted with Lesco rotary spreaders on greens, tees and approaches. PTO-driven Lely L4000 and Vicon PS402 tractor spreaders are used on fairways.

New cutters

Weber says that a pair of Toro 450D mowers was purchased to cut the fairways and roughs, while the Toro Groundsmaster 72 is used for roughs around trees. The Toro Turf Pro 84 trim mower is used for an intermediate fairway cut. Three Lesco 300 triplex mowers cut approaches and collars. Ten Jacobsen 22-inch greensmowers share duty on Old Marsh's tees and greens.

continued on page 48



Tom Regan Golf Course Manager • 1st Hole Bethesda Country Club in Maryland

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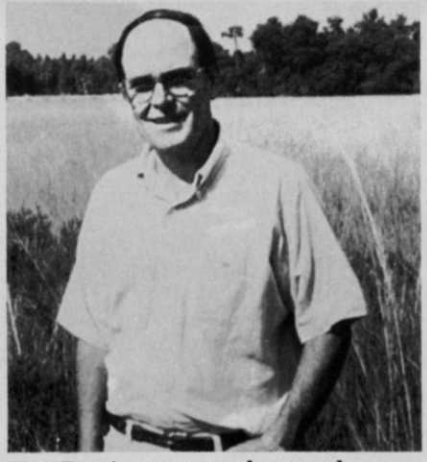
OLD MARSH *from page 46*

Weber calls the Steiner TRS 20 with Triplex mower and four-wheel drive, "an up-and-coming piece of equipment" for use by golf courses with steep banks. Four Honda ATC 250s came in handy for supervisors during the course construction stage, but more importantly, are now efficient transportation vehicles when used with trailers for the Jacobsen mowers.

"Because the course is so spread out, it's nearly impossible to just walk over to the next green with your mower, so we divided the course into five sections for mowing purposes," Weber explains.

Six Cushman 461 Trucksters transport other workers to their job sites within the course, while four Massey Ferguson tractors serve to pull implements like sweepers and spreaders.

Since pesticides are required year-round in this part of Florida, Weber purchased a Hahn truckster with sprayer, model 3157. He likes to minimize thatch build-up on his fairways by using an Olathe Model 61 PTO-driven blower, pulled by a Massey Ferguson 240 tractor to blow clippings off fairways. In total, Weber purchased 77 pieces of new equipment to maintain the course at old Marsh.



Pete Dye incorporated natural prairies into Old Marsh's design.

Top of the line

The market demographics for both home buyers and club members is decidedly upscale. Prices for homes being built at Old Marsh start at $500,000. Two-hundred-thirteen lots are reserved for single-family homes (90 of which have already been sold). Homesites start at $125,000. The five participating builders are providing custom homes ranging in size from 2,900 to 4,500 square feet. The homes have natural materials and color schemes that express "old Florida" in their quality, style and compatibility with the surroundings of native flora.

Membership in the traditional club is limited to 300 members, who each pay an equity fee of $35,000. A $3.5 million clubhouse—sitting proudly between the 9th and 18th greens and overlooking a beautiful, preserved marsh, was due to welcome members in late December.

Designed by Atlanta architects Nichols Carter Grant, the 21,000-square-foot, one-story structure features natural wood and tabby stucco construction, with rich earthtone colors finishing the exterior. In addition to featuring a dining room and cocktail lounge, a spacious men's locker room with sauna, steam room and an adjoining men's grill, the Old Marsh clubhouse also houses the golf shop and administrative offices.

Near the clubhouse is a 275 x 200-yard practice area complete with four target greens with bunkers, two chipping and two putting greens. Weber believes it is one of the best practice facilities available.

"Being a part of the construction of this course was a great experience, but it sure was nice to see that first foursome tee off," says Weber. **LM**

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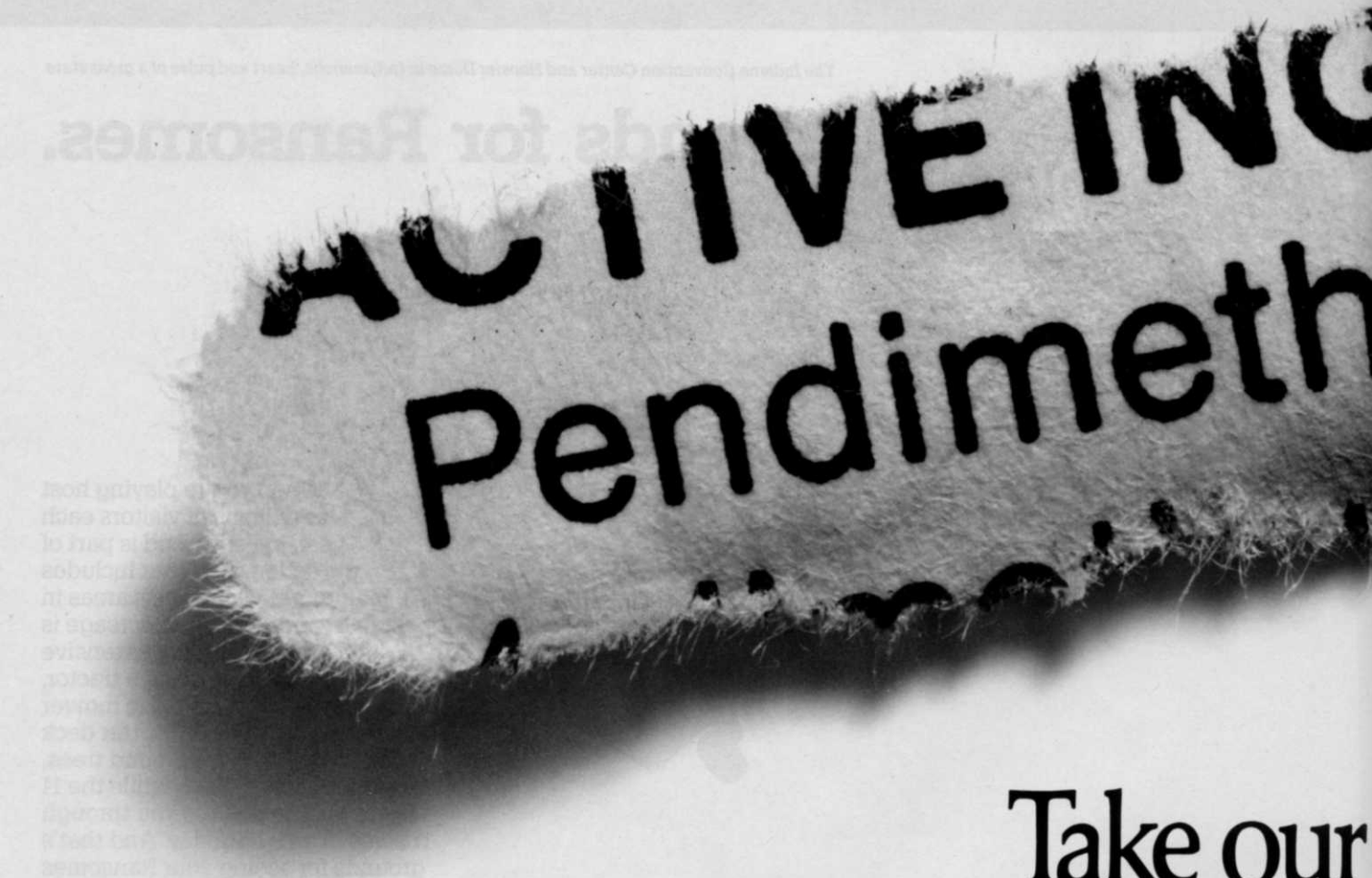

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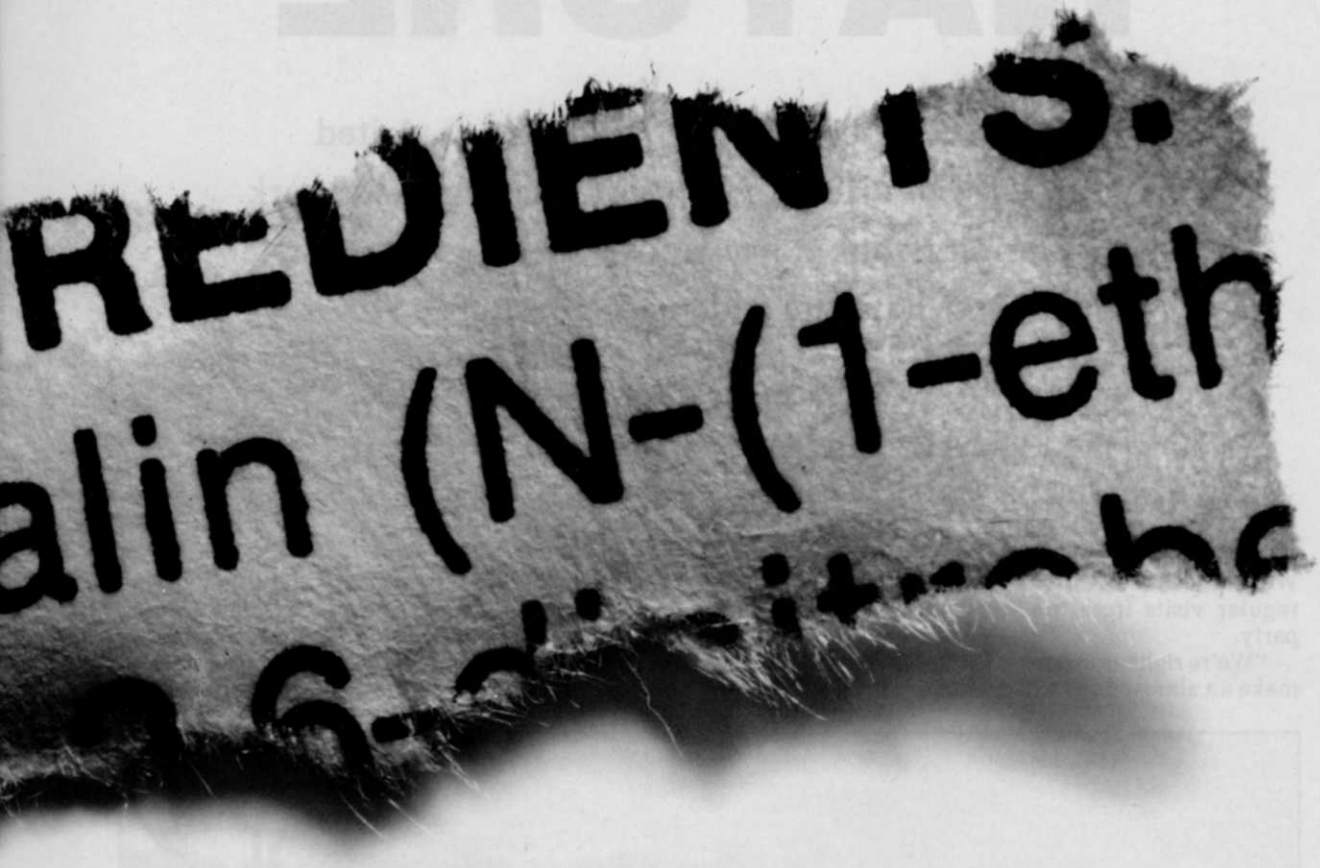
But pendimethalin controls more than just crabgrass. One low rate also prevents other tough grassy weeds including foxtail, fall panicum, barnyardgrass, and *Poa annua*. Hard-to-control broadleaf species like oxalis

crabgrass control.



word for it.

and spurge are also eliminated with the same rate.

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IN TOUCH WITH NATURE

Blacklick Woods Metro Golf Course is visited regularly by wildlife from the surrounding metropark. The superintendent, however, would be a little happier without the added animal traffic.

by Jeff Sobul, assistant editor

Kerry Ortmeyer could probably use some help from the late Marlin Perkins of TV's "Wild Kingdom." His course, 36-hole Blacklick Woods Metro Golf Course near Columbus, Ohio, gets regular visits from the local wildlife. But it's no party.

"We're right next door to the park," he notes. Deer make an almost daily trek across the course. "Whatever gets in their way, they just go right across it."

By land...

A number of holes get deer tracks on the greens and in the sand traps. (Ortmeyer speculates that the deer like the way the sand feels on their hoofs.) He says that if the deer walk across the course the damage is usually minimal. But if they run, and the course

Despite an ongoing program to plant trees over the past 10 to 15 years, Blacklick Woods Golf Course remains relatively wide open, to the delight of most weekend golfers.

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happens to be a bit moist, then there are problems with tracks. The deer also ate a wildflower area he was attempting to establish, as well as some other flower beds.

Ortmeyer says, however, that deer problems are not that serious, merely annoying. Besides, he adds, "we're not allowed to do anything because all park lands are open to wildlife. The course is part of the park. The deer have more right to be there than we do."

Wildlife problems don't stop there. "We are vastly overpopulated with racoons and skunks," Ortmeyer says. When grubs invade the fairways, immediate roughs and green banks in September and October, skunks and racoons follow shortly thereafter, tearing up the ground in search of the tasty little morsels.

Part of the problem, Ortmeyer notes, is that the park is "landlocked," surrounded on all four sides by either interstate highways or housing developments. "(The animals) don't have anywhere else to go," he says. "They've literally torn up whole areas looking for grubs."

Ortmeyer estimates that he and his crew spend three to six hours per day repairing damage done by the little furballs. Sometimes it involves removing and reseeding the damaged area, other times it only involves rolling a piece of sod displaced by a racoon back in place.

This year and last year the problems have been mostly with masked chafer grubs. However, seven or eight years ago, the city of Reynoldsberg, the closest town to the park, suffered a Japanese beetle invasion. These were taken out just in time for the masked chafers to arrive. "If it's not one thing, it's another," Ortmeyer laments.

The grubs like to take up residence on green banks shielded from the wind. "We get mostly west winds so grubs infest the east-facing green banks where they have shelter from the wind," Ortmeyer says. "When the winds are from the east, the grubs are on the west side."

The grubs like to take up residence on green banks shielded from the wind.

For four years he had been using Oftanol to control the grubs, with some success. Now, however, the Oftanol seems to no longer be effective. Therefore, Ortmeyer has switched to using Sevin and Mocap.

The insecticides got an early test this year. In the spring, grubs started surfacing on the fairway near the creek on the par five 4th hole, and the 'coons and skunks started feasting. Ortmeyer came in with an application of Sevin and Mocap, watered them in well and effectively got rid of the grubs.

...and by air

Geese also cause problems at Blacklick Woods, as they seem to do at many courses. Ortmeyer says they overwinter near the course and in spring they congregate on course ponds.

They eat turf on greens and fairways and then leave their deposits on the same. Luckily (for the golfers), there are only a few ponds on the course so the problem is not a major one. It did become enough of an inconvenience to get the Ohio Department of Natural Resources out to trap and transplant a number of the foul fowl. "We've had a few others come in," notes Ortmeyer, "but they don't seem to be hanging around."

The geese are probably fortunate they aren't hanging around. The two courses, one championship length and one executive length, handle about 75,000 rounds each year, about 60 percent on the championship course. That's a lot of errant golf balls for the geese to dodge.

Year-round job

The course is open year-round so those rounds are spaced out somewhat over the course of an entire year. Ortmeyer stresses that being open year-round does not put any added pressure on him or the course. "The weather is what puts pressure on me.

"If we're going to have problems, we don't let it get out of hand," he says. "If our tees and greens aren't playable, we won't open."

Ortmeyer terms this past winter as extraordinary. "There was much play during the winter," but, he adds, "we weren't open more than 45 days over a three-month period (December-February)."

"We open when conditions are suitable," adds course general manager Joe Hoover. "We'll close the course even in the summer. It's a day-to-day decision."

Working in traffic

Maintaining a high level of playability around all those golfers is a difficult task for Ortmeyer's six full-time staffers and six or seven additional summer help.

Because of the traffic, Ortmeyer notes, "we can't do everything we want. We have to get in and get out fast." To conserve time and keep disruption of play to a minimum, the staff works on only one nine-hole section at a time. Aerifying and top-dressing are done on a limited basis at best, but he says they have "plenty of chemicals doing a good job."

His biggest cultural problem has been anthracnose on *Poa annua* in poa/bluegrass fairways. A fungicide program has kept that in control. The greens are bentgrass. "We don't have the irrigation or budget to maintain bent fairways," he notes. "but our budget is enough so that we don't have to cut corners either."

The course is funded by Franklin County though it is actually a sub-division of the state. A board of directors is appointed by a state probate judge to run the course. The course submits its own budget to the county and, according to Ortmeyer, has had sufficient funding in each of the 19 years he has been superintendent.

Keeping in shape

One of the most successful methods the course has had for keeping costs down has been to hire a staff mechanic. "We do a pretty good job of maintaining our old equipment," he says proudly. That equipment includes 20-year-old tractors and a 15-year-old Cushman Truckster.

"Any 18-hole facility should have a mechanic who understands the equipment," he advises. "A mechanic can pay for himself by keeping a machine running."

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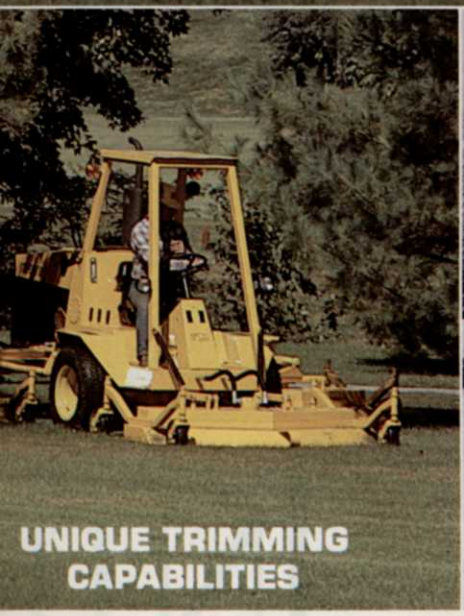

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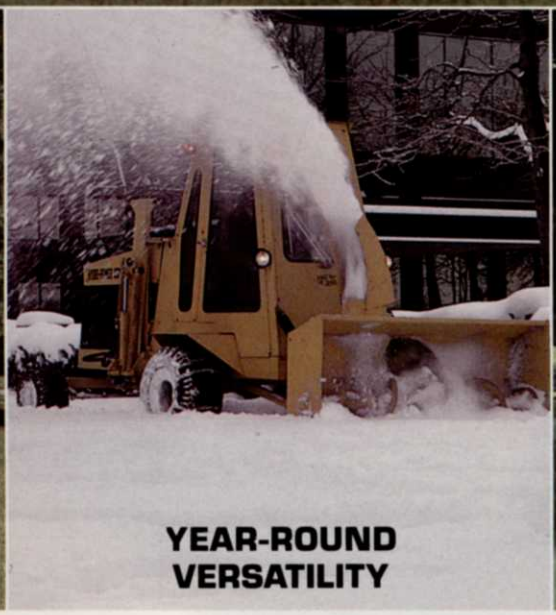

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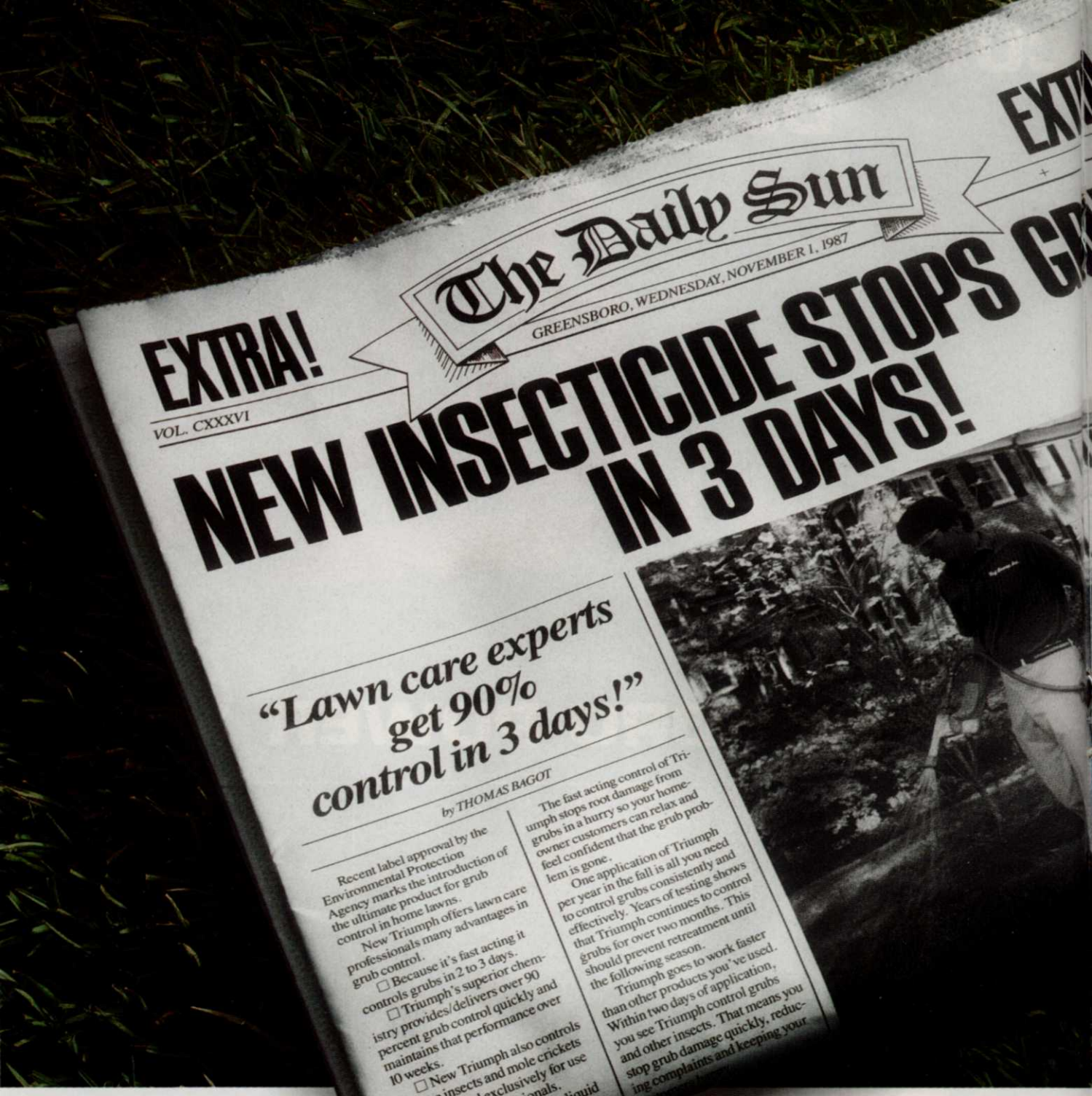
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by THOMAS BAGOT
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BUILDING THE LINKS AT SPANISH BAY

An all fine fescue course is a bold stroke at Pebble Beach. Yet The Links at Spanish Bay is giving it a shot.

Despite the drought tolerance of fine fescue, Spanish Bay is irrigated. The system is checked by assistant superintendent Carl Rygg.

Imagine for a moment that you're about to tee off at a links-type course in Scotland. You toss a blade of fescue grass in the air to test the wind; you're exhilarated by the coastal view, the wind-swept dunes with bunkers formed over the years by sheep seeking shelter from the elements. You remember the history of those who have passed this way before. You tug at your tam, take a practice swing and address the ball...

The bunkers, dunes and absence of trees on the course are similar, and fine fescues covering the course from tee to green are the same. But you're playing The Links at Spanish Bay, Pebble Beach, Calif. What nature needed years to develop in Scotland was very intentionally integrated into this 6,870-yard, par-72 course along the 17 Mile Drive.

The design team of Robert Trent Jones Jr., Tom Watson and Frank D. "Sandy" Tatum transformed the 195 acres into a world-class course with large dunes, rolling fairways clipped short from tee to green, a continuous concrete cartpath, state-of-the-art amenities and equipment. A superb blending of the old and new.

Superintendent Mike Phillips started with the Pebble Beach Co. in 1978. He has been superintendent at Spyglass Hill and Pebble Beach Golf Links where he supervised preparations for the 1982 U.S. Open. After coming to Spanish Bay, Phillips was responsible for supervision and construction of The Links, and now, its overall maintenance. Assistant Carl Rygg had 14 years experience at the Steamboat Springs course in Colorado. Rygg helps supervise the staff of 28.

Plans and permits

Greenscape Ltd. built the course, but years of planning and permits preceded the first scoop. The Links at Spanish Bay falls into the authority of the California Coastal Commission. With committee meetings, review boards and public hearings behind, the Coastal Commission approved the plans and granted a permit for the construction of a golf course on July

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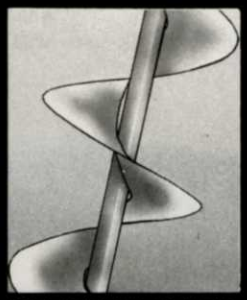

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The Links at Spanish Bay has 95 acres of fine fescue. It's the only fine-fescue course in the United States.

11, 1985.

This permit was contingent on the reconstruction of 100 acres of silicon sand dunes that had been mined from the 1930s through 1973. All that was left was coastal bedrock, so a conveyor belt system was implemented to transport sand two miles from Sand City. In May, 1986 the conveyor belt began hauling the 530,000 cubic yards of sand required to construct and contour the dunes...some up to 24 feet high.

As part of the land reclamation agreement in the Monterey County Land Use Plan, Pebble Beach Co. is replanting the dunes with native plant species and enhancing two wetland areas. Ryegrass and native plants were hydroseeded onto the dunes in June 1986. The ryegrass is to stabilize the sand until the native plant seedlings could establish.

Some of the flowering plants included in the seeding program are California beach poppies, pink sand verbena, lizard tail and yellow bush lupine. The dunes themselves are planted in dune sedge, a gray-green low growing plant that becomes a buffer between the native plants and the maintained areas of the course. Dune sedge covers the gallery areas. Ice plant, used for dune stabilization at one time, is not native to the area, so the spreading vegetation must be removed by hand...a painfully slow and labor-demanding process.

'Fine' turf

The Links at Spanish Bay is the first all fine fescue golf course in the United States; 95 acres are seeded with the fine-leafed cool-season grass.

"Fine fescues are commonly found in fairways and tees as part of a mixture," explains Phillips, "but mowing them at 5/32 of an inch for daily play is an innovative concept. The more the course matures, the more impressed we are."

The course was said to be outstanding for its "soft" opening on Nov. 4, 1987.

The turf seeding, fertilization and maintenance recommendations were prescribed by Rich Hurley, Ph.D., of Lofts Seed.

The tee and fairway blend is 1/3 Jamestown, 1/3 Barthala and 1/3 Koket; all chewings type fescue. Tees and fairways were seeded at a rate of 250 lbs./acre. This amount was felt to be adequate even though 300 lbs. was recommended. Roughs and steep grades were also seeded at 250 lbs./acre with a blend of 40 percent Reliant hard fescue, 30 percent Ensylva creeping red fescue and 30 percent fairway/tee blend.

The greens were all seeded with a 50/50 mix of Jamestown chewings fescue and Exeter colonial bentgrass. This is actually 20 percent fine fescue and 80 percent bent by weight. The base for the greens is a 14 inch sand/peat cap with 10 percent peat. Of the 90 percent sand, 90 percent of that is in the medium grade range.

Fertilizer applied at the first seeding was 16-16-16 with one lb. N/1000 sq.ft. Establishment rates for the first 14 months was 21-7-4 after eight weeks, with four lbs. N/1000 sq.ft. "Fertilization rate now that the course has matured is determined by soil testing," Phillips says. "We then order our fertilizer with minor nutrients mixed according to the resulting analysis."

Tees and fairways are mowed at 1/2 inch with triplex mowers with catchers. Greens are hand mowed at 5/32 inch. In addition to golf, the 24,000-sq.ft. clubhouse will accommodate a pro shop, locker rooms, starter area, retail shops, health club and 50-patron restaurant/bar. Across from the clubhouse are eight outdoor tennis courts with pro shop and lockers.

As with the other Pebble Beach Company courses, The Links at Spanish Bay will be open to the public. Carts are required and winds with gusts to could be a factor, but playing this unique course will offer its own rewards. **LM**

A crew member rakes one of Spanish Bay's large sand traps.

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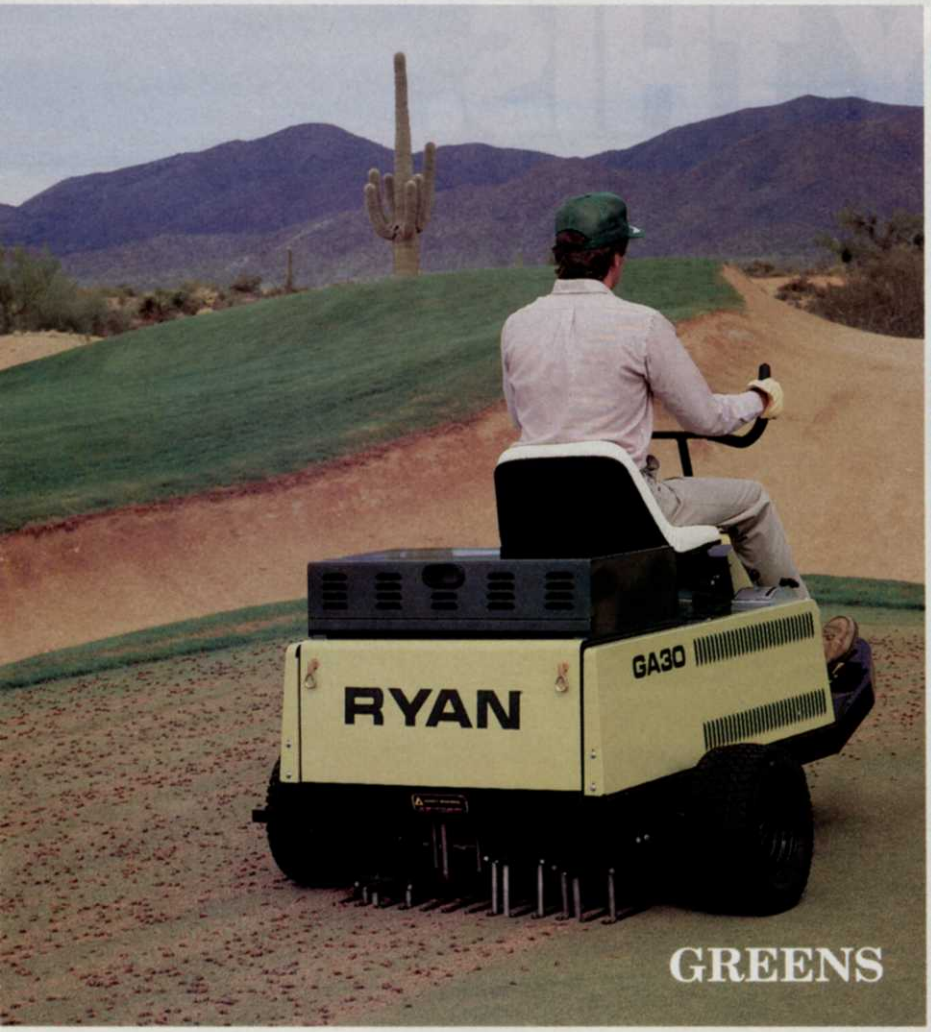

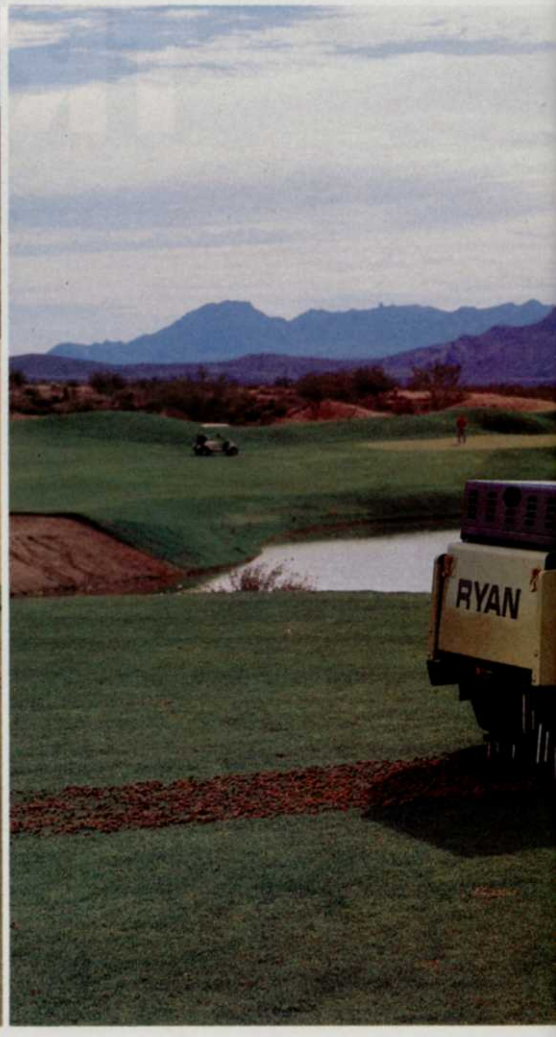

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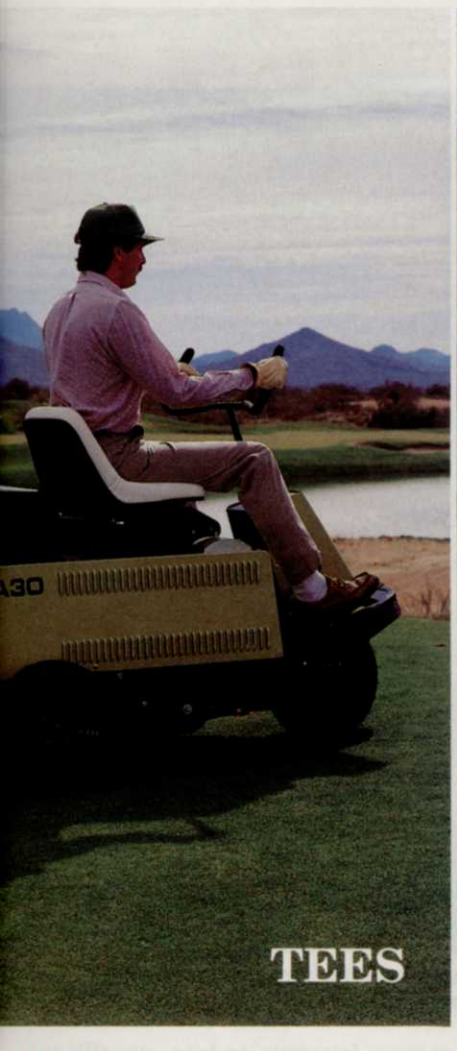

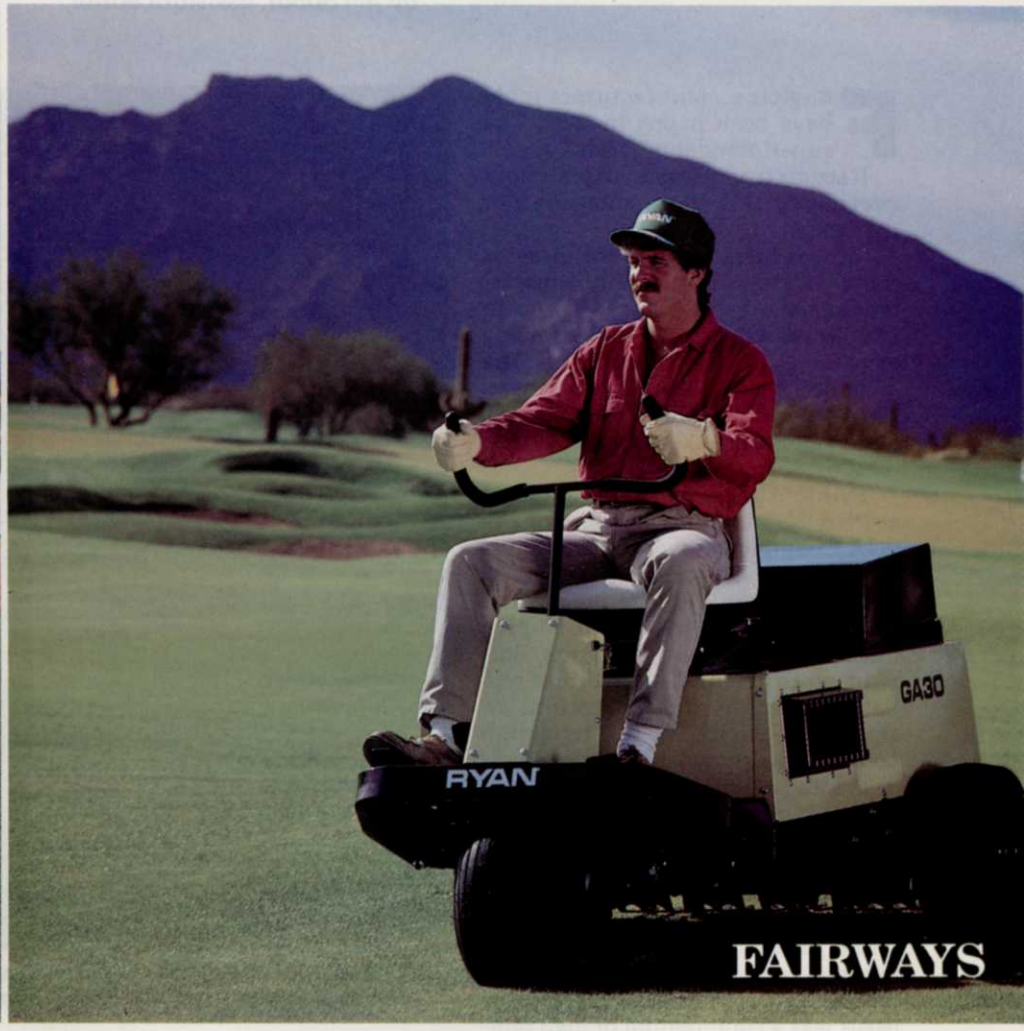

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A STRONG RECOVERY

Golf course superintendents weathered a disease-filled year in 1987. But the new year holds promise for better health.

by Jeff Sobul, assistant editor

Fungicide manufacturers must have been happy in 1987. The superintendents? Well. . . .

It seems turf diseases hit just about everybody this year, some harder than usual.

"It was ideal weather for diseases this year," says Joseph Baidy, superintendent at Acacia Country Club in Lyndhurst, Ohio. "We had so many extremes this year with all the moisture we had and then dryness. The grass really couldn't tolerate it." Baidy notes that take-all patch did the most damage at Acacia.

Pythium blight reared its ugly head at PGA National just in time for the PGA Championship and the national media. Nearly 20 straight days of temperatures above 90 during the day and 70 at night, combined with 90-plus humidity, ravaged the bentgrass/Bermudagrass greens. The pythium was helped along by the presence of an aquatic herbicide in the irrigation water, unbeknownst to superintendent Luke Majorki.

At Quail Hollow in Painesville, Ohio, the presence of diseases was constant this summer. Along with leaf spot, dollar spot and pythium, among other things, superintendent Jim Loke found brown patch on some greens, tees and fairways. "That was a first," he comments. The cause for the diseases was a combination of high temperature and humidity and weakened turf. "In general, everybody had problems with pythium this year," he concludes.

Dan Pierson, superintendent at Cherry Hills Country Club in Englewood, Col., reports that his course was one hit by pythium this year. It should be noted that the Denver area's climate is usually not conducive to turf diseases. The humidity is low and the summer temperatures generally drop down far enough at night to keep diseases at bay. In fact, the course only has a $6,000 chemical budget.

However, one Friday night it happened. "I was out Saturday morning and was not cognizent of what the humidity had been the night before. One of the tees had pythium running through it pretty badly," Pierson says. "A lot of guys around here have never seen pythium."

Though high-priced, lightweight mowing is making bentgrass fairways a reality on many courses, reducing compaction and cutting water use.

Pierson says they had enough fungicide in house to spot spray, then bought enough material from a local distributor to treat the greens and tees and put a preventive down. He says the par-three eighth hole was hit particularly bad, but it was mostly *Poa annua* that was killed. "It was kind of a Godsend," he says.

Speaking of poa

Is there control in sight? Possibly.

"The tools are at hand to perpetuate poa or remove it to the extent wanted," says Tom Watschke, Ph.D., Penn State University.

The decision then is whether to keep the poa or eventually convert greens, fairways or tees, usually to bentgrass. New growth regulators are entering the market which will perform one of those two tasks.

The host of new regulators include Cutlass from Elanco, O.M. Scott's TGR, and Embark, marketed by PBI Gordon. Nor-Am's Prograss herbicide and Elanco's Rubigan fungicide have also been tested as poa reducers. Researchers at Michigan State University may have discovered a biological control for poa (see Research Update in this issue for more information).

To strengthen annual bluegrass, Watschke says Embark will inhibit seedheads but improve the stand of existing turf when at seed. In addition, poa benefits because Kentucky bluegrass shows signs of weakening when treated, Watschke says, and

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Pythium won the "Disease of the Year Award" for most appearances by a pathogen on different golf courses in 1987.

thus is more susceptible to disease.

Ohio State's Karl Danneberger, Ph.D., has also seen this reaction from both the annual and Kentucky bluegrasses, but has no hard data. However, when Embark is applied regularly to an area, he seems to notice more annual bluegrass.

Cutlass and TGR also inhibit poa seedheads but selectively reduce poa to aid conversion to desired species, usually bentgrass since these products are used mainly on golf course fairways. (The only side effect is some discoloration of the bent.) From there, Watschke says, cultural practices can help to speed the conversion: strict water management and lower cutting heights. Danneberger suggests using these in conjunction with overseeding of desired species.

Stan Zontek, Mid-Atlantic Region director of the USGA Green Section agrees. "A single chemical or management practice rarely controls *Poa annua* by itself," he says. "The best results are obtained when all the programs are meshed together."

There are some cautions in using Cutlass, TGR, Prograss and others to reduce poa, especially if the percentage of poa in the treated turf isn't exactly known.

"The problem is sometimes you really don't know how much poa you have," Danneberger says. He notes that annual bluegrass and Kentucky bluegrass can look pretty similar when cut at, say, two inches. The key then is to assess the turf closely when going in to kill the poa. Zontek adds that the chemicals should first be tested on a limited basis to avoid massive annihilation of poa.

Danneberger says Prograss, a herbicide registered to kill annual bluegrass, has been most successful killing annual bluegrass in Kentucky blue and perennial ryegrass.

Despite these successes—and they are successes—Danneberger says, "it's always going to be there; it's always going to be a problem." When Kentucky bluegrass weakens or dies, it's replaced by annual bluegrass. When annual bluegrass dies, it's replaced by annual bluegrass.

"I'm not ready to write it off," Danneberger concludes. "It's going to be here long after I'm gone."

Muirfield Village Golf Club superintendent Michael McBride concurs. "I don't think you'll ever get rid of poa. People have been trying to get rid of it for 50 years. You can keep it under control, to a certain point, but I don't think you can totally eliminate it and keep it out effectively and economically."

Lightweight

One of the cultural practices that shows hope for propagating bent on fairways, thus helping to reduce poa, is lightweight mowing.

This is one of the newest management practices to be developed, starting about eight years ago at Coldstream Country Club in Cincinnati, Ohio. As with other "inventions," this was discovered somewhat by accident, and then by experiment: using a greensmower on an approach that was compacted by a heavy fairway mower.

Continued on page 68

The lightweight five-gang mower from Lesco could increase lightweight equipment quality and bring prices down to the budget of the public course.

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Circle No. 137 on Reader Inquiry Card

RECOVERY *from page 66*

As the turf improved, experimentation spread to a par-three fairway, and then the rest of the course. It has now spread to numerous cool-season courses where bentgrass is the dominent or desired species.

It is not a fad, says Kevin Dushane, superintendent at Bloomfield Hills (Michigan) Country Club, where he has used lightweight mowing for six years. It is a general shift in cultural practices that improves bentgrass noticeably. Those who use it rave about its effects. Lighter-weight machines, such as the Toro 84 triplex, reduce compaction and improve root zone development and drainage.

"I think the biggest thing is compaction," Dushane says. His lightweight mowing has resulted in improved playability and aesthetics. "When the program first started," he says, "the membership was really pleased with it."

"It's amazing," says Acacia's Baidy. "You don't know what you have in the fairway until you start mowing with a triplex." On one fairway, he says, bent now covers 90 percent of the turf because of lightweight mowing.

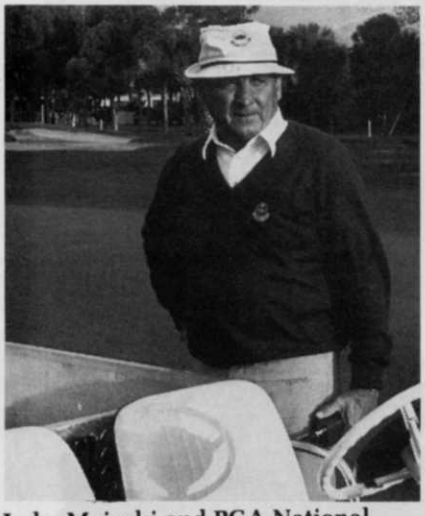
"You can cross-cut and do anything you want with the triplex and go different angles and it helps the grass," he says, "and it gets rid of deep gullies."

As with many good things, there is a flip side. Lightweight mowing is expensive. New machinery can run $30,000 to $50,000 for sufficient equipment (three triplexes or two five-gangs). Many public courses have little hope of affording the equipment at this time.

Also, because the units are smaller, they take more time and labor. Dushane estimates it takes three triplexes 15 to 18 man-hours to cut 18 holes, plus picking up clippings if so desired. One man on a seven-gang, he says, can do the same job in perhaps six man-hours.

However, Dushane feels that the expense balances out in less water use, sometimes as much as one-third, and healthier grass requiring less fertilizer. Plus, he says, "If you're going to have a better golf course the members will pay for it." And anytime you can make such an improvement on 25 to 30 acres, it can't be all bad.

And there is hope for lower-budget courses. Dushane feels the recent introduction of the less-expensive Lesco five-gang lightweight mower will lead to an opening of the market and a reduction in overall equipment prices and an improvement in equipment quality.



Luke Majorki and PGA National were hit by massive pythium right before the 1987 PGA Championship.

In conclusion

It may sound from this report like 1987 was a down year for golf courses. On the contrary, it has been a year far and above anyone's expectations (see lead article this section). There seems no reason to believe 1988 won't be at least as good.

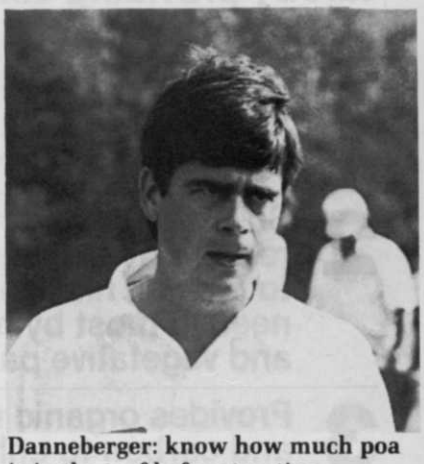
The black layer issue has died down some, mainly because speculation on the cause and nature of the disease is giving way to some hard data, most notably by Joe Vargas, Ph.D., at Michigan State University and Clint Hodges, Ph.D., Iowa State University (see October and November, 1987, LANDSCAPE MANAGEMENT). There is some hope that a solution to the problem will be found this year or next.

Turf diseases will be around as usual, and there seems no catch-all solution, except maybe to get an earlier start on preventive applications. (Danneburger has been recommending April or May.) But things probably won't be much worse than in 1987.

As long as the economy remains strong, the golf course industry should follow right along. The only problem with that is a shortage of seasonal labor because of lower unemployment, which the industry can probably live with for now.

So, happy disease-hunting, and have a good 1988. **LM**

McBride: poa can be controlled but never eliminated economically.



Danneberger: know how much poa is in the turf before treating.

Despite Denver's arid climate, Dan Pierson and Cherry Hills Country Club had to deal with pythium.

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At the heart of the new, four-wheel 807 is a powerful 21.5 horsepower, 3-cylinder Kubota 950 diesel engine. We've also included a heavy-duty Donaldson air cleaner and a new, heavy-duty Cushman PTO clutch to keep your new Cushman Front Line running longer. A complete family of Cushman Front Lines and a wide range of accessories are available to meet all your needs all year 'round.

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Circle No. 113 on Reader Inquiry Card

GOLF PRODUCTS

Fluid overflow systems stops leaks and streaks

Standard Golf's improved Professional Series Ball Washer features a fluid overflow system that prevents leaking and streaking of the case.

The overflow tube keeps the fluid level below the crank shaft opening in order to prevent soap from building up on the outside of the case. It cannot be overfilled.

A drain plug makes it easy to drain and can't be overtightened. The washer can handle up to four balls at a time, comes in eight colors and can be mounted on a number of stands.

Circle No. 190 on Reader Inquiry Card

Limb chipper features 90-degree in-feed angle

Promark Products has introduced the model 400 brush and limb chipper to handle tough brush and limb jobs.

The 400 chipper uses a 90-degree in-feed angle to let both knives cut the full diameter of the limb. The chipper

provides a fixed hydraulic feed rate of 152 F.P.M.

A safety bar on each side and over the top of the hopper can instantly start, stop or change the direction of the feed rollers. The feed table is located at the rear of the chipper to keep operators away from moving parts. The two 14½-inch knives and 14-inch bed knife will cut limbs as large as 10-12 inches in diameter.

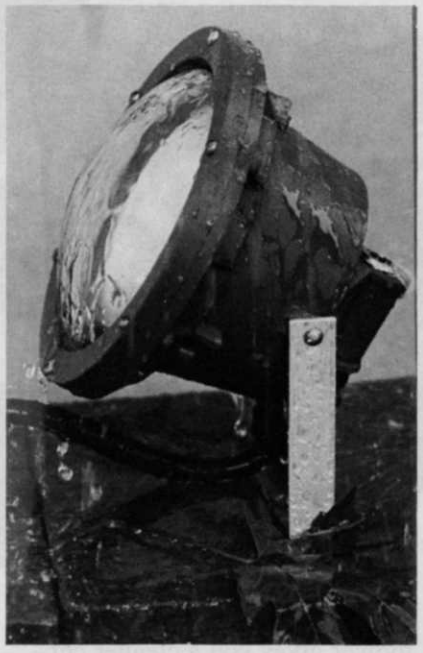
Circle No. 191 on Reader Inquiry Card

LV lighting system brightens floating aerators

A high-intensity, low-voltage lighting system from Barebo, manufacturer of Otterbine floating aerators, is designed for use in conjunction with Otterbine floating aerators.

However, the light's universal mounting bracket allows its use on any type of fountain such as those around pools.

The light meets national electric code requirements and passes testing standards of the electrical test-



ing laboratories, according to the company.

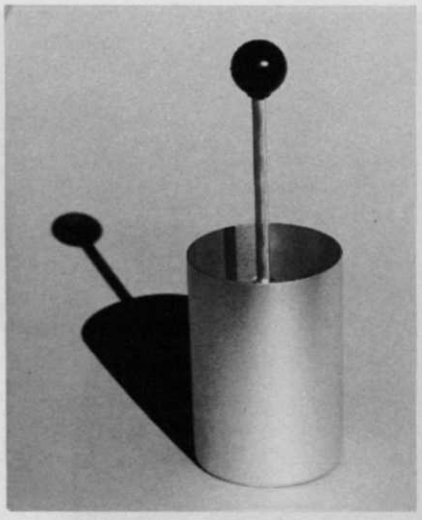
Circle No. 192 on Reader Inquiry Card

Simple device removes water from cup holes

The Model 950 Cup Hole Cleaner from Par Aide removes water from cup holes before turf plugs are replaced. In doing so, it helps eliminate unsightly turf damage resulting from plugs replaced in water-filled putting green holes.

When placed in the hole, water rises through a center tube and flows into the outer holding section of the cup cleaner, which is lifted out and emptied.

Par Aide will display this and other products at booth 2053 of the Golf Show.



Circle No. 193 on Reader Inquiry Card

Custom flags emblazoned with course logo or number

Custom flags from J.D. Ober are made of 100 percent nylon and sewn with sun-resistant Dacron thread and double hems.

Personalized logos or numbers are screened with long-lasting epoxy ink. The flags are mounted on double-sided grommets or plastic tubes.

Circle No. 194 on Reader Inquiry Card

Portable sprayer comes with or without wheels

Falkenberg's Spotlyte portable sprayer is available with pneumatic tires for towing or without wheels for easy mounting on trucks, tractors or ATVs.

The Spotlyte comes with a 20-gallon polyolefin tank with an eight-inch vented lid. The tank also has a 20-year U.V. protection. The sprayer comes with a 30-foot nylon reinforced hose and lightweight gun with an adjustable conejet nozzle.

Available options include addi-

WE PACK A FULL SEASON OF WORRY-FREE WEED CONTROL INTO EVERY BAG.

Only CHIPCO® RONSTAR® herbicide gives you safe, season-long control of crabgrass, goosegrass and tough broadleaf weeds.

Like most turf professionals, you want a herbicide that works the first time, every time. One that controls crabgrass, goosegrass and tough broadleaf weeds all season long...without damaging your turf.

But there's only one place you'll find that kind of control. Inside every bag of CHIPCO RONSTAR herbicide.

A single application of CHIPCO RONSTAR herbicide delivers the longest-lasting, most dependable pre-emergence control of crabgrass and goosegrass you can buy. In addition, CHIPCO RONSTAR herbicide keeps oxalis, carpetweed and many other broadleaves out of sight and out of mind.

Unlike most turf herbicides, CHIPCO RONSTAR herbicide controls weeds without harming turfgrasses. In fact, tests prove that CHIPCO RONSTAR herbicide will not cause the root pruning problems associated with other products.

CHIPCO RONSTAR herbicide can also be used near trees, ornamentals and ground covers without fear of damaging sensitive varieties. And, CHIPCO RONSTAR herbicide won't leach or move laterally like some other herbicides.

When it's time to plan your weed control program, remember the herbicide that has everything you need in one bag. CHIPCO RONSTAR G herbicide or new CHIPCO RONSTAR WP herbicide.

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HERBICIDE

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Circle No. 150 on Reader Inquiry Card

tional hose lengths, 12 volt or 110 volt connections, flat fan nozzle, solution tank agitator and variable pressure control.
Circle No. 195 on Reader Inquiry Card

Cabinet maker branches into golf course market

Robert P. Marasco Cabinets has added golf signs to the company product line. The sandblasted , 1½-inch-thick vertical grain redwood signs come painted in a variety of colors indicating tees, hazards, distances, etc.

In addition, the company shoots distances for accurate installation of yardage markers. It will also install tee markers if requested.
Circle No. 196 on Reader Inquiry Card

Injection-molded products add to company's line

Five new injection-molded golf accessories have been added to Outdoor Products' line of golf accessories. Directional signs are sturdy plastic and 6x12 inches in size.

They are mounted on foot-long stakes. Two-inch lettering is easy to read from a distance.

Flat anti-rebound tee markers are made of high-impact plastic in red, white, blue and yellow. The one piece markers are five inches in diameter but just a quarter inch thick to virtually eliminate rebound from a dubbed shot.

Erasable ink makes for multi-purpose directional signs for nearly any purpose. The company also manufactures proximity markers for closest to pin and longest drive contests, and 15-inch tall (when in ground) hazard stakes.

Circle No. 197 on Reader Inquiry Card

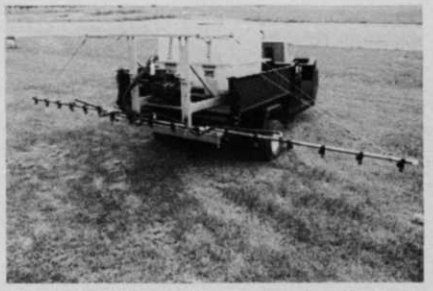
Boom sprayer mounts on back of golf cart

The Westheffer Company's newest golf cart sprayer features a "Cable-flex" boom, a completely cable-suspended boom for less bounce and more even coverage. "Cable-flex" booms are available in 15- or 21-foot lengths.

The sprayer also features an adjustable boom height rack, three section boom control valve, an easy-to-read pressure gauge and a polyethylene corrosion-resistant tank with 100- or 150-gallon capacities.

In addition, it comes with a centrifugal pumping system and gas engine or PTO drive. The golf cart sprayer is also available with a 30- to 40-foot swath Boomjet. A handgun, hose and hose rack assembly for spraying trees and shrubs is optional.

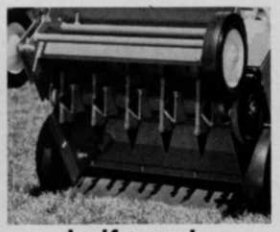
Continued on page 74



Circle No. 198 on Reader Inquiry Card

Before you fertilize . . .

GET THE THATCH OUT!



knife reel

flail reel

According to turf experts, **excessive thatch** must be **removed** after a hard winter in order to have healthy turf in the spring. Thatch prevents **nutrients** from reaching down into the root structure. Result: the lawn cannot breathe and grow properly.

BlueBird has the **most complete line** of power rakes in the industry, a rake for every lawn and purpose. Spacings for every application. Interchangeable flail reels and knife reels are available for vertical mowing, and together they answer **every need** of lawn service professionals in every part of the country. Call your distributor **today** for a BlueBird catalog. For the name of your distributor call the BlueBird Action Center. BlueBird International Inc., 2778 South Tejon, Englewood, Colorado 80110. Phone (303) 781-4458.

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They harvest "off the turf" and cut close up to pipes, ditches and the edge of the field, reducing waste.

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There is room for two stackers, and the conveyor and cutting blade are operated by finger-tip hydraulic controls.

The optional Autosteer system eliminates waste, increasing yield per acre, and reduces driver fatigue. It also produces consistent, accurate width regrowth strips.

Brouwer products are quality engineered for superior performance and reliability.

For more information or video demonstration contact your Brouwer agent. Also enquire about the Brouwer Lease Plan. (U.S. only)

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Circle No. 107 on Reader Inquiry Card

Company's complete line fits golf course needs

A complete line of golf course accessories from Rico Manufacturing & Supplies can outfit a golf course from the practice green to the 18th tee.

Fiberglass flag poles come in regulation and tournament sizes in seven- and eight-foot lengths and are highly flexible. Custom striping is available.

Fiberglass sand trap rakes have a flexible four-foot handle and will float if they encounter any angry golfers. Flags come in custom designs with either numbers, course logo or both in tube or grommet styles. The silk-screened nylon flags also come in sizes for putting greens.

In addition, the company manufactures ABS plastic cups and other accessories like brooms and squeegies.

Circle No. 199 on Reader Inquiry Card

Hole designs etched in 'natural stone'

Tri Dimensional Designs puts numerous finishes and colors in a distinguished appearance on new Cylex Granite signs.

The signs won't crack or peel and have the look of real sandblasted granite. Raised or depressed lettering gives distinctive, multi-dimensional signs.

The company also makes tee, cart path and yardage markers in both Cylex granite and Cylex marble.

Circle No. 200 on Reader Inquiry Card

Jacobsen triplex works in tough conditions

Jacobsen's new Tri-King 1471 offers superintendents 3-wheel drive. The new option gives operators better traction and maneuverability. The triplex will perform on slopes or in wet conditions.

The turf manager can mold the mower to fit the property's conditions. The triplex is available with options including 5- or 10-blade reels, grass catchers, grooved or solid front wheels, front micro-height adjusters and traction wheel weights.

Circle No. 201 on Reader Inquiry Card

Ball washer cleans up with six-pint capacity

The new Lesco Ball Washer has a six-

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1987 Landscape Manager of the year
Michael Hugg

Entry forms are now being accepted by the Professional Grounds Management Society and Landscape Management magazine for their second annual "Landscape Manager of the Year" award.

Purpose of the award is to recognize superior job performance among landscape managers, to challenge those involved in the industry to achieve higher standards of excellence, and to bring national recognition to deserving managers.

Any person directly responsible for the professional maintenance of one or more landscapes is eligible to enter. Applicants will be judged according to job performance, honors and awards, procedures and philosophies, and contributions to the green industry. Applicants will be asked, at the time of entry, to submit four 5 x 7 black-and-white glossy photos and 10 color 35mm slides of current work areas with a short narrative on each.

(clip and mail)

Applicant's name _____ Title _____

Applicant's company _____

Official entry form should be sent to:

Name _____ Title _____

Company _____

Address _____ City/State _____ Zip Code _____

Mail to: PGMS, Landscape Manager of the Year, 1201 Galloway Ave., Suite 1E, Cockeysville, MD 21030

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The Andersons introduces Tee Time™ with Team® and Dursban®.

New Tee Time with Team and Dursban controls weeds, kills pests and fertilizes in one easy application.

It can help you provide more effective, more efficient service. Because it lets you cut down on service calls, without cutting down on service.

This great labor saver is available in many analyses. It's also available in a half rate of Team and a full rate of Dursban. But this 3-in-1 product is only available from The Andersons.

So to find out more about new Tee Time with Team and Dursban, just call 1-800-225-ANDY, or contact your local Tee Time distributor. And get the latest TurFact from your partner.

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Circle No. 101 on Reader Inquiry Card

pint capacity and is constructed of rigid ABS plastic.

The helix-shaped agitator, unlike crank-type agitators, provides agitation for complete cleaning. A minimum of working parts keeps mechanical troubles down.

The red plastic body resists damage, can be painted as desired and can be personalized with decals.

Circle No. 202 on Reader Inquiry Card

Tee markers supported by national sponsorship

Tee markers manufactured by T-Graphics, Inc., are made of sandblasted California redwood and painted in different colors for for tees, fairways, greens and hazards.

The company operates on a national sponsorship program which allows golf courses to obtain the signs for free, and even get revenue sharing for each sign.

The company does this by attracting national sponsors such as American Express, for the signs. The advertising pays for the signs, which are supplied to golf courses at no charge under a five-year program. Courses get $75 per sign per year in

revenue sharing.

About 400 courses receive the signs, which the courses must install. T-Graphics will be in booth 2653 at the GCSAA Show.

Circle No. 203 on Reader Inquiry Card

Controlled release nitrogen has low burn potential

Coron slow release nitrogen fertilizer from the Coron Corporation is an organic slow release fertilizer with low burn potential.

It is storage stable and has low volatility of nitrogen to the atmosphere to stay where it is put. Coron promotes quick green-up and even turf growth over a longer period of time.

It is compatible with commonly available turf care products and is easily blended into N-P-K liquid fertilizer.

Circle No. 204 on Reader Inquiry Card

Repair tool cuts sod for all parts of golf course

The Turfgrass Repair Tool from Gordon Witteveen Enterprises cuts a square

piece of sod nearly four inches deep. It is ideal for repairing scars and scrapes, fertilizer burns or chemical spills.

The Repair Tool can be used on tees, greens and fairways. It is available in six- or nine-inch sizes.

Circle No. 201 on Reader Inquiry Card

Broyhill

3030 Series
Broyhill's Deluxe State-of-the-art Turf & Commercial Sprayer

2000 Series
Broyhill's Best - A Low Profile, Versatile Tree & Turf Maintenance Unit

See The Performance & Quality, Features & Selection Our Customers Are Talking About At The GCSAA Show, Booth No. 919 February 1988, Houston, Texas

Special Offer

All Turf Dealers who place a new order for one of Broyhill's 2000, 960 or 3030 Series units will receive **FREE** our Item 2330-CS5 - a 5 gal. cordless cart sprayer with 110 volt A.C. charger, spray gun and 12 ft. of hose.
Offer valid until February 1, 1988 or while supply lasts.

The Broyhill Company
Dakota City, NE 68731-0475
Phone: 402-987-3412
Telex: 438082

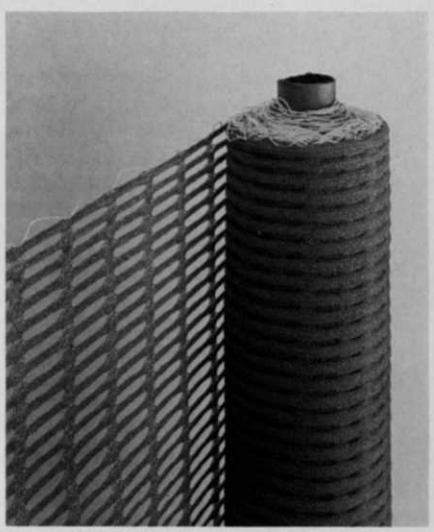
Circle No. 108 on Reader Inquiry Card

Versatile barrier fence available for crowd control

"Fence-it Plus," a barrier fence, is available from J.A. Cissel Mfg. The versatile Fence-it can be used for crowd control, as a snow fence or to protect newly-seeded areas.

It is highly UV-stable, has long life and is lightweight and easy to install.

It is available in rolls of 4x50 feet and 4x100 feet. See J.A. Cissel at booth 2838 at the Golf Show.



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EXCELERATE '88

Set A New Landscape Speed Record

Ask any seasoned turf maintenance professional, and they'll tell you that productivity is measured in maneuverability.

The Excel Hustler's unmatched performance comes from its unique ***hydraulic steering*** *that lets you trim close, even cut square corners without wasted motion. And there are no clutch or brake pedals to fool with. You have total command of the mower's forward, reverse and turning movements with just one-hand!*

Start setting your own landscape speed records. Visit your local Hustler dealer today, or call Excel toll-free for the name of the dealer nearest you.

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Turf & Grounds Equipment

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Circle No. 236 on Reader Inquiry Card

BOOKSTORE

345 - COST DATA FOR LANDSCAPE CONSTRUCTION 1987
Kathleen W. Kerr, Editor
An updated unit cost data reference for designers and cost estimators. Developed to fill the tremendous need for detailed landscape construction cost data. Laid out in easy-to-use CSI format. Annual
$32.00

350 - HANDBOOK OF LANDSCAPE ARCHITECTURAL CONSTRUCTION
edited by Jot Carpenter
A practical how-to reference on landscape construction. Published by the Landscape Architecture Foundation, the book carries the expertise of more than 25 landscape professionals. **$45.00**

300 - LANDSCAPE DESIGN: A PRACTICAL APPROACH
by Leroy Hannebaum
Geared for the commercial designer/salesperson, this is a one-stop guide to the landscape design process. Covers the entire highly competitive field including design analysis techniques, pointers on land forms, specialized business landscaping methods, environmental design guidelines, specifications, estimations, bids. **$33.95**

370 - LANDSCAPE OPERATIONS: MANAGEMENT, METHODS & MATERIALS
by Leroy Hannebaum
An in-depth examination that combines technical training in landscape science with methods of accounting, business management, marketing and sales. Discusses effective methods for performing lawn installations, landscape planting and maintenance. Step-by-step accounting calculations are explained in simple terms. **$31.95**

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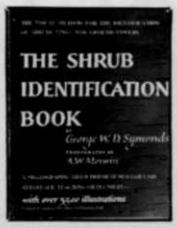

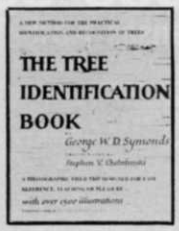

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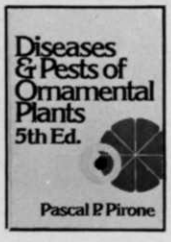

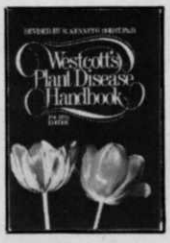

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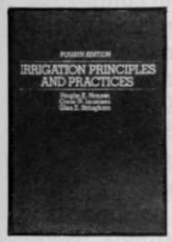

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MANAGEMENT COMMITTEES...YECCH

Golf course superintendents are consistently great about dealing with agronomic problems. But there are others problems.

by Rudd McGary and Ed Wandtke

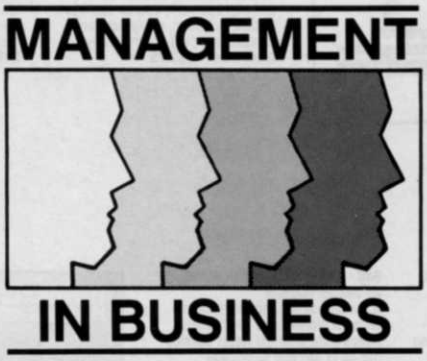
One of the hardest things about being a golf course superintendent is having to work with the various management committees. While this is a fact of life, many managers find that their time frame, particularly for new equipment or other major expenditures, depends on the committees approving a budget or unforeseen expenses arising from weather or climatic stresses.

Here are some factors to consider when working with these committees. The following suggestions may help to lessen the time between request and approval. They may also yield a better working relationship with the committee.

1. The committee generally isn't a full-time body involved in day-to-day operations. Because of this, you have to plan both your regular budget requests plus a plan for contingency spending. This can be done in the following manner.

2. Try to select an executive committee from your major committee. In other words, select a smaller group from the larger one and agree that these people can vote on unforeseen expenditures. If you do this, you will at least have a smaller group with which you can work, which may help lessen the time needed for decisions.

Wandtke and McGary are senior consultants with All-Green Management Associates in Columbus, Ohio. Dr. McGary focuses on marketing and managenent issues. Wandtke focuses on operations and financial questions.



3. A second way to deal with unforeseen expenditures is to have a second fund, clearly earmarked for use only in emergencies. You don't have to draw down on it during the year, but it will be there if needed.

4. Prepare any requests, particularly your major budgets, well before time. Then send them to the committee before the meeting so that they have time to consider your requests. This will generally save you from having to explain everything in the proposal at the time when you are actually making it.

5. After you send out the budget, call the people on the committee—at least the key people. Make sure they understand why you have made the requests and be prepared to answer any questions. It's always easier to have people on your side before you meet with the whole committee so that they can help in the discussions.

6. Remember that most committee members wouldn't know fescue from Bermudagrass. On many occasions, too much time is spent explaining technical agronomic information that doesn't mean much to committees. The committees aren't chosen because of their agronomic background, so don't give them too much technical data with which to work.

7. Always have alternatives ready. By doing this, the committee can vote on fewer expenditures, thus feeling better about what is spent for your program. This means that you might offer them a "Blue Ribbon" program, which includes every type of turf management possible; as well as a second program, one that includes all you need for the year. If the committee approves the top program, more power to you. If not, you at least have all the essentials needed for the year. The committees like to feel that they have costs under control. Give them something to cut from the budget and they'll do it.

8. Finally, don't just talk to the committee once a year. Most superintendents can identify the key people on the committee, but occasionally don't keep the communication lines open during the year. The spring, when everything is greening up, is a good time to invite the various committee members to walk the course with you. Anytime the the course is looking green and lush is a good time to take a committee member on a tour.

Summary

The basic issue here is that committee people usually represent someone else. They may represent the whole membership. If so, they are generally more conservative than if they represented only themselves. So your job is to make them comfortable about the actions they take on behalf of others. In order to do this, you need to give them information on a timely basis, give them options, and continue communication with them throughout the year. If you do these things, you'll find that meeting with your management committees can be productive, and that these people are working with you. **LM**

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LANDSCAPE MANAGEMENT

1987 ARTICLE INDEX

Aeration: Bringing back the grass
Jim Mello, August, p. 22
Allen Keesen Landscaping
Jerry Roche, February, p. 60
Anatomy of an I.P.M. program
Deborah Smith, Stanton Gill, August, p. 46
Aquatic weed control
June, p. 34
Arizona Biltmore Hotel
Carl Kovac, March, p. 78
Athletic turf: Royal flush
Heide Aungst, March, p. 82
Athletic turf: Safety to the max
Heide Aungst, June, p. 18
Athletic turf: Three strikes, you're out
Heide Aungst, June, p. 30
Bahama Princess Resort
Heide Aungst, April, p. 34
Black layer and blue-green algae
Clinton Hodges, Ph.D., October, p. 38; November, p. 30
Boardwalk & Baseball
Jeff Sobul, March, p. 38
Buyer's guide
September, p. 34
Calculating costs
Heide Aungst, September, p. 12
Castlewoods Country Club
January, p. 36
Cleaning Miss Liberty's House
Robert L. Tracinski, February, p. 100
Computers in the green industry
Rudd McGary, Ed Wandtke, October, p. 50; November, p. 34
Consultants: Have soil probe, will travel
Jerry Roche, April, p. 78
Country Club of North Carolina
Hal LeSieur, March, p. 104
The Davey Company, Milwaukee
Jerry Roche, November, p. 42
Davis Landscape Contractors
Jerry Roche, February, p. 55
Detroit Tigers' Tigertown
July, p. 44
Disease control guide: cool-season
Joe Vargas, Ph.D., May, p. 32
Disease control guide: warm-season
Don Blasingame, Ph.D., May, p. 46
Diversified services
Rudd McGary, Ed Wandtke, March, p. 110
Divine Divisions
Heide Aungst, January, p. 80
Druid Ridge Cemetery
Heide Aungst, January, p. 72
Endophytes: an update
January, p. 60
The Equipment Evolution
Heide Aungst, February, p. 64
Equipment: You can pay me now...
George Thompson III, February, p. 88
Fall marketing
Rudd McGary, Ed Wandtke, September, p. 26
Fertilization guide for cool-season golf course turf
David Wehner, Ph.D., August, p. 38
Fertilization guide for warm-season golf course turf
Joseph M. DiPaola, Ph.D, August, p. 36
Findlay, Ohio, High School
Jeff Sobul, June, p. 49
Ford Motor Company
April, p. 90
GCSAA conference schedule
January, p. 65
Golf: 'I need a drink'
Jeff Sobul, January, p. 34
Government gloom
Jeff Sobul, March, p. 88
Illini Country Club
March, p. 100
Insect control guide
Harry D. Niemczyk, Ph.D., Patricia Cobb, Ph.D., March, p. 46
Irrigation revelations
July, p. 34
King's Island Golf Course
March, p. 94
Lake Barrington Shores
April, p. 28
The Landscape Expo: year two
February, p. 80
Landscape Manager of the Year
Jeff Sobul, April, p. 44
Lawn and landscape fertilization
Richard Rathgens, January, p. 56
Lawn care: Year of the buy-out
Jerry Roche, November, p. 40
Legislation vs. Landscapes
Heide Aungst, December, p. 32
Loading: for loads of profitability
November, p. 24
Management evaluation
Rudd McGary, Ed Wandtke, August, p. 56
Marketing maneuvers
Rudd McGary, Ed Wandtke, April, p. 88
McGinty Brothers Lawn and Tree
Heide Aungst, November, p. 41
Mower trends
Heide Aungst, April, p. 63
Muirfield Village: Jack's Baby
Jeff Sobul, December, p. 22
National Park Service
Heide Aungst, December, p. 36
Nightlighting: Afraid of the dark?
Jeff Sobul, April, p. 52
Northwest Landscape Industries
Ken Kuhajda, February, p. 51
Ohio University
Jerry Roche, September, p. 14
Olympia Fields Country Club
Jeff Sobul, August, p. 30
On Design
Heide Aungst, April, p. 76; May, p. 60; June, p. 62; July, p. 40; August, p. 54; September p. 30; October p. 36; November, p. 48
Parks: the Emerald Necklace
Carl Kovac, February, p. 96

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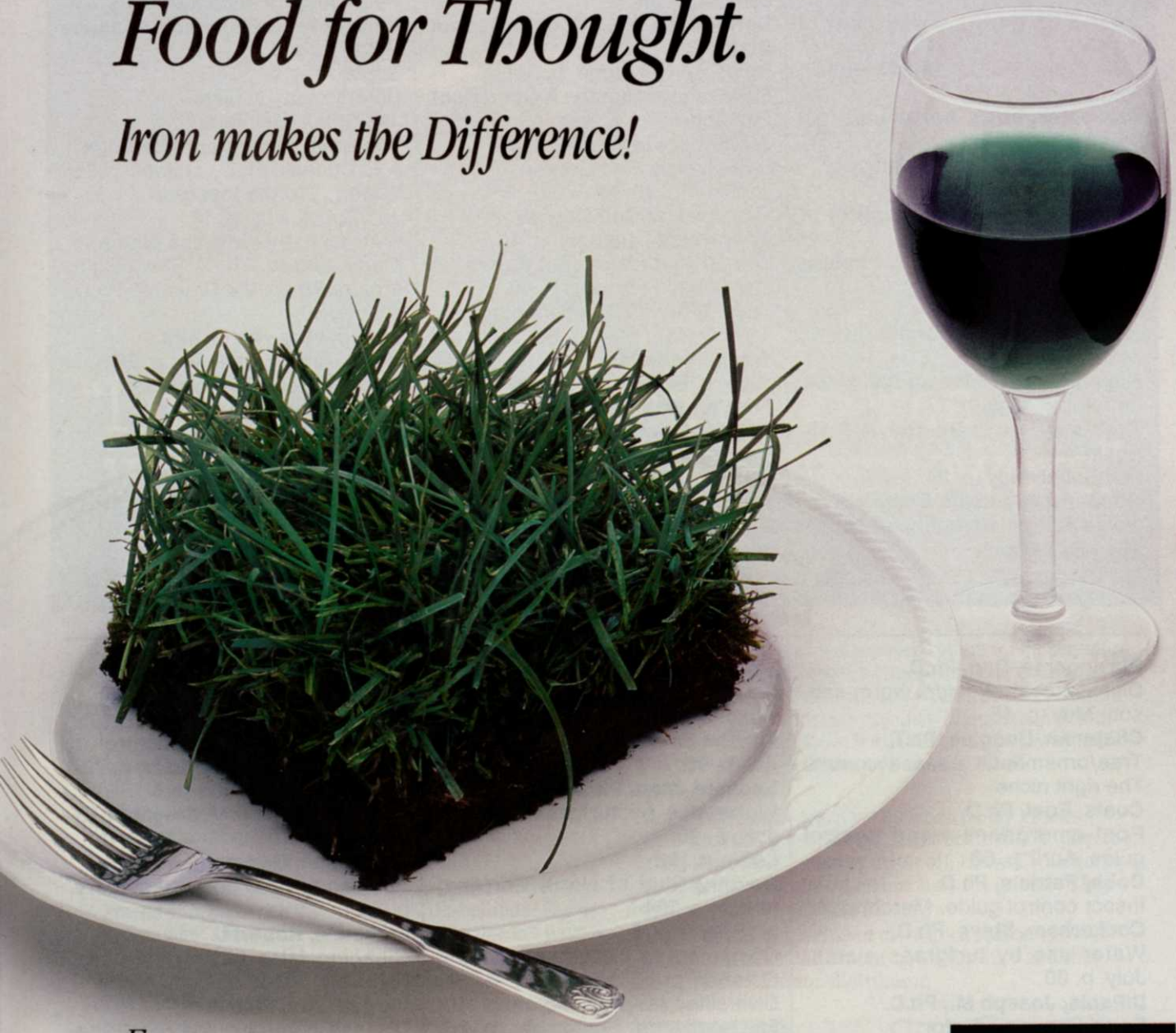

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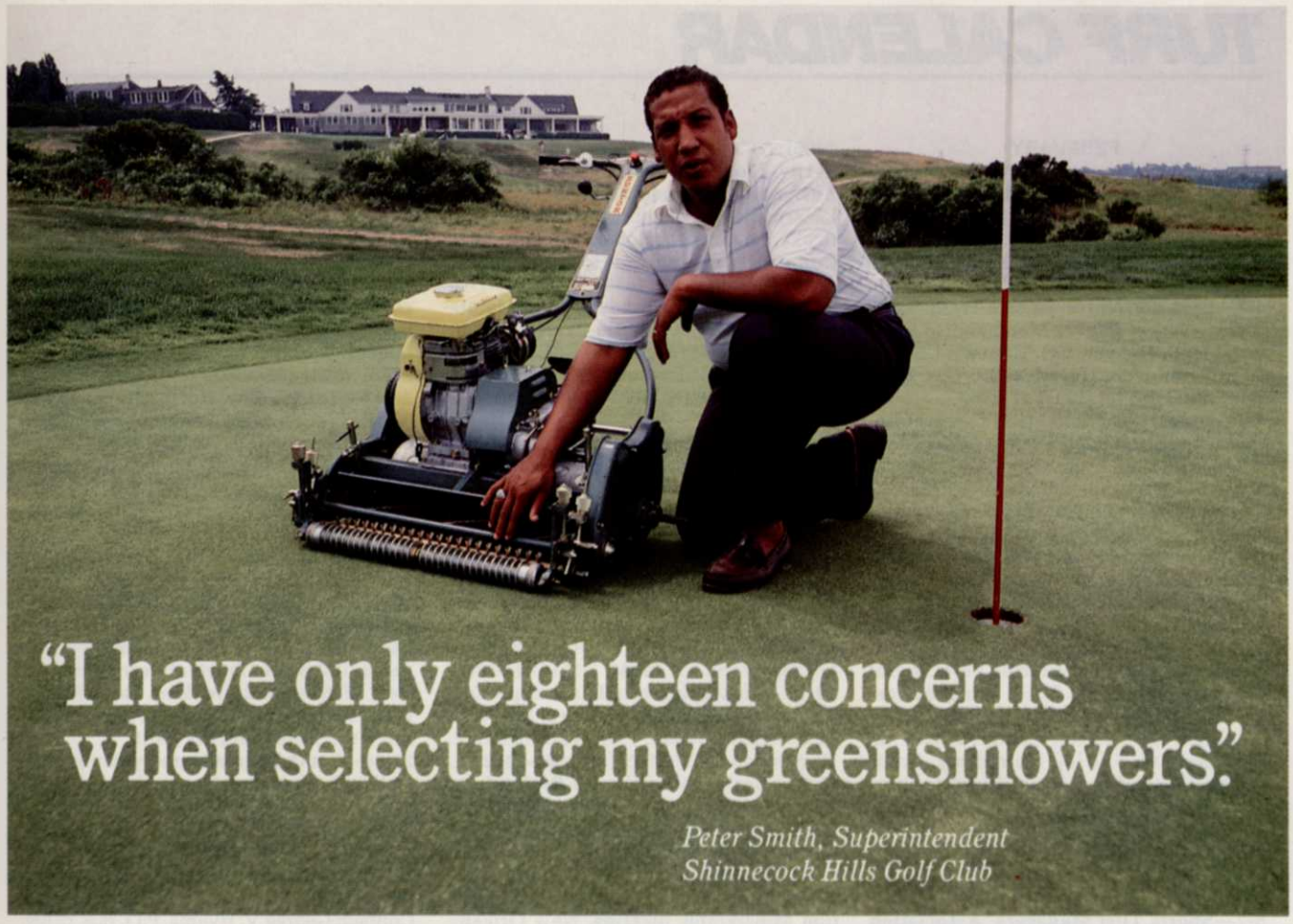
Pay as incentive
Rudd McGary, Ed Wandtke, January, p. 88
Personnel evaluation
Rudd McGary, Ed Wandtke, July, p. 58
Post-emergence weed control guide
Euel Coats, Ph.D., John R. Hall III, Ph.D., April, p. 68
Pre-emergence herbicides for warm-season turf
Tim R. Murphy, Ph.D., February, p. 71
Pre-emergence weed control of cool-season turf
Robert Shearman, Ph.D., February, p. 70
Purchasing
Rudd McGary, Ed Wandtke, June, p. 66
Rights-of-way: Making the grade
Jeff Sobul, May, p. 27
Rights-of-way: On the R.O.W. again
Jeff Sobul, May, p. 24
Ruppert Landscape Company
Heide Aungst, February, p. 46
The seed supply
Jeff Sobul, October, p. 20
Slow release, fast relief
January, p. 50
Sources of Capital
Rudd McGary, Ed Wandtke, December, p. 46
Springfield, Pa., County School District
Heide Aungst, June, p. 54
State of the Industry: A Good Root Feeding
Jeff Sobul, December, p. 28
Stonehenge Golf Course
January, p. 48
Tanglewood Golf Course
Jerry Roche, January, p. 42
Top 50 landscape contractors
Jeff Sobul, February, p. 40
Torre & Bruglio Landscaping
Jerry Roche, May, p. 56
Tracking tractors
June, p. 58
Tree/ornamental disease control: The right niche
Douglas J. Chapman, Ph.D., March, p. 76
Training systems
Rudd McGary, Ed Wandtke, February, p. 92
Tree Land Nurseries
Heide Aungst, February, p. 50
Turf Calendar
December, p. 42
Turf research: a rare breed
Heide Aungst, March, p. 30
University of Minnesota/Waseca
Heide Aungst, September, p. 16
U(versa)tility vehicles
Jeff Sobul, October, p. 32
Water: an endangered heritage
A.E. Dudeck, Ph.D., October, p. 56
Water: ...To the last drop
Jeff Sobul, July, p. 18
Water use by turfgrass plants
Matt Leonard, Ph.D., Steve Cockerham, Ph.D., Vic Gibeault, Ph.D., July, p. 30
Where were you in '62?
Heide Aungst, January, p. 28
Harry Wilcox: An old master
Jerry Roche, June, p. 44
'Wild' flowers
Ann Reilly, April, p. 84
Wildflowers: Going wild
Heide Aungst, May, p. 18
Working on the railroad
July, p. 50

CONTRIBUTING AUTHORS

Blasingame, Don, Ph.D.
Disease control guide: warm-season, May, p. 46
Chapman, Douglas, Ph.D.
Tree/ornamental disease control: The right niche
Coats, Euel, Ph.D.
Post-emergence weed control guide, April, p. 68
Cobb, Patricia, Ph.D.
Insect control guide, March, p. 46
Cockerham, Steve, Ph.D.
Water use by turfgrass plants, July, p. 30
DiPaola, Joseph M., Ph.D.
Fertilization guide for warm-season golf course turf, August, p. 36
Dudeck, A.E., Ph.D.
Water: an endangered heritage
Gibeault, Vic, Ph.D.
Water use by turfgrass plants, July, p. 30
Gill, Stanton
Anatomy of an I.P.M. program, August, p. 46
Hall, John R. III, Ph.D.
Post-emergence weed control guide, April, p. 68
Hodges, Clinton, Ph.D.
Black layer and blue-green algae, October, p. 38; November, p. 30
Kovac, Carl
Arizona Biltmore Hotel, March, p. 78; The Emerald Necklace, February, p. 96
Leonard, Matt, Ph.D.
Water use by turfgrass plants, July, p. 30
LeSieur, Hal
Country Club of North Carolina, March, p. 104
McGary, Rudd
Computers in the green industry, October, p. 50, November, p. 34; Diversified services, March, p. 110; Fall marketing, September, p. 26; Pay as incentive, January, p. 88; Personnel evaluation, July, p. 58; Purchasing, June, p. 66; Sources of Capital, December, p. 46; Training systems, February, p. 92
Mello, Jim
Bring back the grass, August, p. 22
Murphy, Tim R., Ph.D.
Pre-emergence herbicides for warm-season turf, February, p. 71
Niemczyk, Harry D., Ph.D.
Insect control guide, March, p. 46
Rathgens, Richard
Lawn and landscape fertilization, January, p. 56
Reilly, Ann
'Wild' flowers, April, p. 84
Shearman, Robert, Ph.D.
Pre-emergence weed control of cool-season turf, February, p. 70
Smith, Deborah
Anatomy of an I.P.M. program, August, p. 46
Thompson, George III
You can pay me now..., February, p. 88
Tracinski, Robert L.
Cleaning Miss Liberty's House, February, p. 100
Vargas, Joe, Ph.D.
Disease control guide: cool-season, May, p. 32
Wandtke, Ed
Computers in the green industry, October, p. 50, November, p. 34; Diversified services, March, p. 110; Fall marketing, September, p. 26; Pay as incentive, January, p. 88; Personnel evaluation, July, p. 58; Purchasing, June, p. 66; Sources of Capital, December, p. 46; Training systems, February, p. 92
Wehner, David, Ph.D.
Fertilization guide for cool-season golf course turf, August, p. 38



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TURF CALENDAR

FEBRUARY

1 (other dates as well)—Tree Care/Landscape Training. Northwood Resource Systems, Inc., Tiffin, OH. Contact: Richard V. Jones, Suite 100, 277-285 Martinel Dr., Kent, OH 44240; (216) 678-1912 or (800) 637-4473.

1-3—Colorado Nurserymen's Trade Show & Conference. Denver Merchandise Mart, Expo Hall, Denver, CO. Contact: Cary or Judith Hall, 746 Riverside Dr., Box 2676, Lyons, CO 80540; (303) 747-2662.

1-8—59th International Golf Course Conference & Show. Golf Course Superintendents Association of America. George R. Brown Convention Center, Houston, TX. Contact: GCSAA, 1617 St. Andrews Dr., Lawrence, KS 66046; (800) 472-7878.

2-3—New England Nurserymen's Association Convention and Trade Show. Copley Plaza, Boston, MA. Contact: Larry Carville, 24 West Rd., Suite 53, Vernon, CT 06066; (213) 872-2095.

2 (also 4 and 16) —California Pest Control Advisers Seminar. Butte Fairgrounds, Tulelake; Barbara Worth Country Club; Anaheim Convention Center, Anaheim, CA. Contact: Shirley Humphrey, Entomology Extension, University of California, Davis, CA 95616; (916) 752-0470.

3—Industrial Vegetation Management Association Meeting. Dallas, TX. Contact: R.M. Cope, 1015 N. 122 St., Omaha, NE 68154; (402) 498-0881.

5-7—Sports Turf Managers' Association Seminar. Houston, TX. Contact: Dr. Kent Kurtz, Sports Turf Managers Association, 400 N. Mountain Ave., Suite 301, Upland, CA 91786. (714) 981-9199.

6—California Landscape Contractors Association Seminar Becoming A Better Manager. Grand Hotel, Anaheim, CA. Contact: Larry Rohlfes, CLCA, 2226 K Street, Sacramento, CA 95816; (916) 448-CLCA.

6—Long Island Tree Conference. Farmingdale, NY. Contact: Long Island Arboriculture Association, P.O. Box AF, Holtsville, NY 11742.

6-9—Michigan Recreation & Park Association's Conference & Trade Show. Detroit Westin Hotel, Detroit, MI. Contact: John F. Greenslit, 2724 E. Michigan, Suite 201, Lansing, MI 48912; (517) 485-9888.

7—Musser International Turfgrass Foundation Meeting. Hyatt Regency, Houston, TX. Contact: Fred V. Grau, P.O. Box AA, College Park, MD 20740; (301) 864-0090.

7-9—The Fertilizer Institute's Meeting. Marriott, Washington, D.C. Contact: The Fertilizer Institute, 1015 Eighteenth St. N.W., Washington, D.C. 20036.

7-10—National Landscape Association/Garden Centers of America Management Clinic. Gault House, Louisville, KY. Contact: Jim Kerkam, 1250 I Street N.W., Suite 500, Washington, D.C. 20005; (202) 789-2900.

8-9—Nightscaping Seminar. Newbury, OH. Contact: Rick Tomko, Site Illuminations, 11008 Kinsman Rd., Newbury, OH 44065; (216) 564-8223 or (216) 338-1408.

8-12—Turfgrass Ecology & Management Short Course. Virginia Tech University, Blacksburg, VA. Contact: Dave Chalmers, Virginia Tech University, Blacksburg, VA 24061; (703) 961-5797.

9-10—Northeastern Pennsylvania Turfgrass & Grounds Maintenance School. Lazerne County Community College, Nanticoke, PA. Contact: Robert Kotch, Luzerne County Extension Service, 200 Adams Ave., Scranton, PA 18503; (717) 825-1701.

9-10—Southern Grounds & Turf Maintenance Exposition. Myrtle Beach Convention Center, Myrtle Beach, SC. Contact: Scott Regan, 111 Executive Center Dr., Columbia, SC 29210; (803) 737-9348 or (800) 554-1182.

10—American Sod Producers Association Motivational Leadership Seminar. Sheraton, New Orleans, LA. Contact: ASPA, 1855-A Hicks Road, Rolling Meadows, IL 60008.

10 (also 11, 17, 18)—Nursery and Landscape Short Course. Palo Alto and Dublin, CA. Contact: Richard Molinar, Cooperative Extension in Alameda County, University of California, 224 West Winton Ave., Room 174, Hayward, CA 94544; (415) 670-5200.

10-11—Massachusetts Landscape Conference. Sheraton Inn, Foxboro, MA. Contact: Virginia Wood, 1357 Washington St., W. Newton, MA 02165; (617) 964-0452.

10-11—Northern California Professional Turf & Landscape Exposition. Santa Clara Convention Center, Santa Clara, CA. Contact: Wanda Sarsfield, P.O. Box 268, Lafayette, CA 94549; (415) 283-6162.

10-12—American Sod Producers Association Mid-Winter Meeting. New Orleans, LA. Contact: American Producers Association, 1855-A Hicks Rd., Rolling Meadows, IL 60008; (312) 705-9898.

11—Mid-Florida Turfgrass Conference. University of Florida Cooperative Extension Service-Agricultural Auditorium, Sanford, FL. Contact: Uday Yadav, 250 W. County Home Rd., Sanford, FL 32773; (305) 323-2500 ext. 182.

11-13—Athletic Turf/Campus Management Seminar. Anaheim, CA. Contact: National Institute on Park and Grounds Management, Box 1936, Appleton, WI 54913-1936; (414) 733-2301.

11—Connecticut Turf and Landscape Conference. Hartford Civic Center, Hartford, CT. Contact: Elizabeth Maisano, Connecticut Grounds Keepers Association, P.O. Box 876, Bethel, CT 06801; (203) 791-8615.

14-18—National Arborist Association Meeting. Marriott, Maui, HI. Contact: Susan Curtis, 174 Route 101, Bedford, NH 03012; (603) 472-2255.

15-16—Nebraska Association of Nurserymen Winter Conference & Trade Show. Hilton Hotel, Lincoln, NE. Contact: David McBride or Kathy Siefken, P.O. Box 80177, Lincoln, NE 68501; (402) 476-3852.

15, 22, 29—Designing, Installing and Cost Esimating Commercial & Residential Irrigation Systems. Extension Conference Center, Cook College, Rutgers University. Contact: Jim Morris (201) 932-9271.

16-18—Nebraska Weed Control Conference. Ramada Inn, Kearney, NE. Contact: Vernon Dyer, Room 105 Courthouse, Lexington, NE 68850; (308) 324-3771.

16-18—Inland Ornamentals Seminar & Turf & Landscape Trade Show. Seminar-Sheraton, Spokane, WA. Show-Fairgrounds. Contact: Tonie Fitzgerald, N. 222 Havana, Spokane, WA 99202; (509) 456-3651.

17—Inland Northwest Turf & Landscape Trade Show. Spokane, WA. Contact: Jones & Associates, North 8712 Calispel, Spokane, WA 99218-2008; (509) 466-1486.

19-20—West Virginia Nurserymen's Association Winter Educational Meeting. Sutton Lanes Motel, Sutton, WV. Contact: James E. Monroe, Rt. 1, Box 33, Talcott, WV 24981; (304) 466-2660.

20-21—Tampa Bay Horticultural Trade Show. Florida State Fairgrounds, Tampa, FL. Contact: Bette S. Walker, 6804-C Gunn Highway, Odessa, FL 33625; (813) 920-4393.

22-23—Ohio State University Professional Lawn Care Seminar. Riverside Inn, Columbus, OH. Contact: Sue White, Dept. of Agronomy, Ohio State University, Room 202, 2021 Coffey Rd., Columbus, OH 43210-1086; (614) 292-2001.

22-23—Shade Tree Symposium. Pennsylvania/Delaware Chapter International Society of Arboriculture, Host Farm Resort, Lancaster, PA. Contact: Sara Attig, 29 Garrett Ave., Rosemont, PA 19010.

22-24—South Dakota Nurserymen's Association Conference & Trade Show. Howard Johnson Lodge & Convention Center. Contact: Bruce Ellingson, 3309 E. 10th St., Sioux Falls, SD 57103; (605) 334-4767.

23—South Carolina Grounds Maintenance Short Course. Holiday Inn, Greenville, SC. Contact: George V. Hyams, P.O. Box 12109, Charleston, SC 29412; (803) 762-1595.

23-25—Western Pennsylvania Turf Conference & Trade Show. Pittsburgh Expo Mart/Marriott Hotel, Monroeville, PA. Contact: P.T.C., P.O. Box 417, Bellefonte, PA 16823-0417; (814) 355-8010.

24—Bergen Landscape '88. Giants' Stadium, East Rutherford, NJ. Contact: Skip Powers, 630 Valley Court, Westwood, NJ 07675; (201) 664-5228 or (201) 327-0820.

25-26—Landscape Industry Conference & Trade Show. Denver, CO. Contact: Chery Flores, 3895 Upham St., Suite 150, Wheat Ridge, CO 80033; (303) 425-4862.

25-26—International Erosion Control Association Conference & Exposition. New Orleans, LA. Contact: Michael McMillan, P.O. Box 195, Pinole, CA 94564-0195; (415) 223-2134.

25-28—ISPO-Spring. Munich Trade Fair Centre, Munich, West Germany. Contact: Gerald G. Kallman, Kallman Associates, Five Maple Court, Ridgewood, NJ 07450-4431; (201) 652-7070.

26—Excellence in Landscape Awards Banquet. Associated Landscape Contractors of Colorado, Denver, CO. Contact: Chery Flores, 3895 Upham St., Suite 150, Wheat Ridge, CO 80033; (303) 425-4862.

29-March 2—Chemical Application Minicourse. Virginia Tech University, Blacksburg, VA. Contact: Dave Chalmers, Virginia Tech University, Blacksburg, VA 24061; (703) 961-5797.

29-March 3—57th Massachusetts Turfgrass Conference & Industrial Show. Springfield Civic Center, Springfield, MA. Contact: Dr. Joseph Troll, RFD #2, 34 Comins Rd., Hadley, MA 01035; (413)549-5295.

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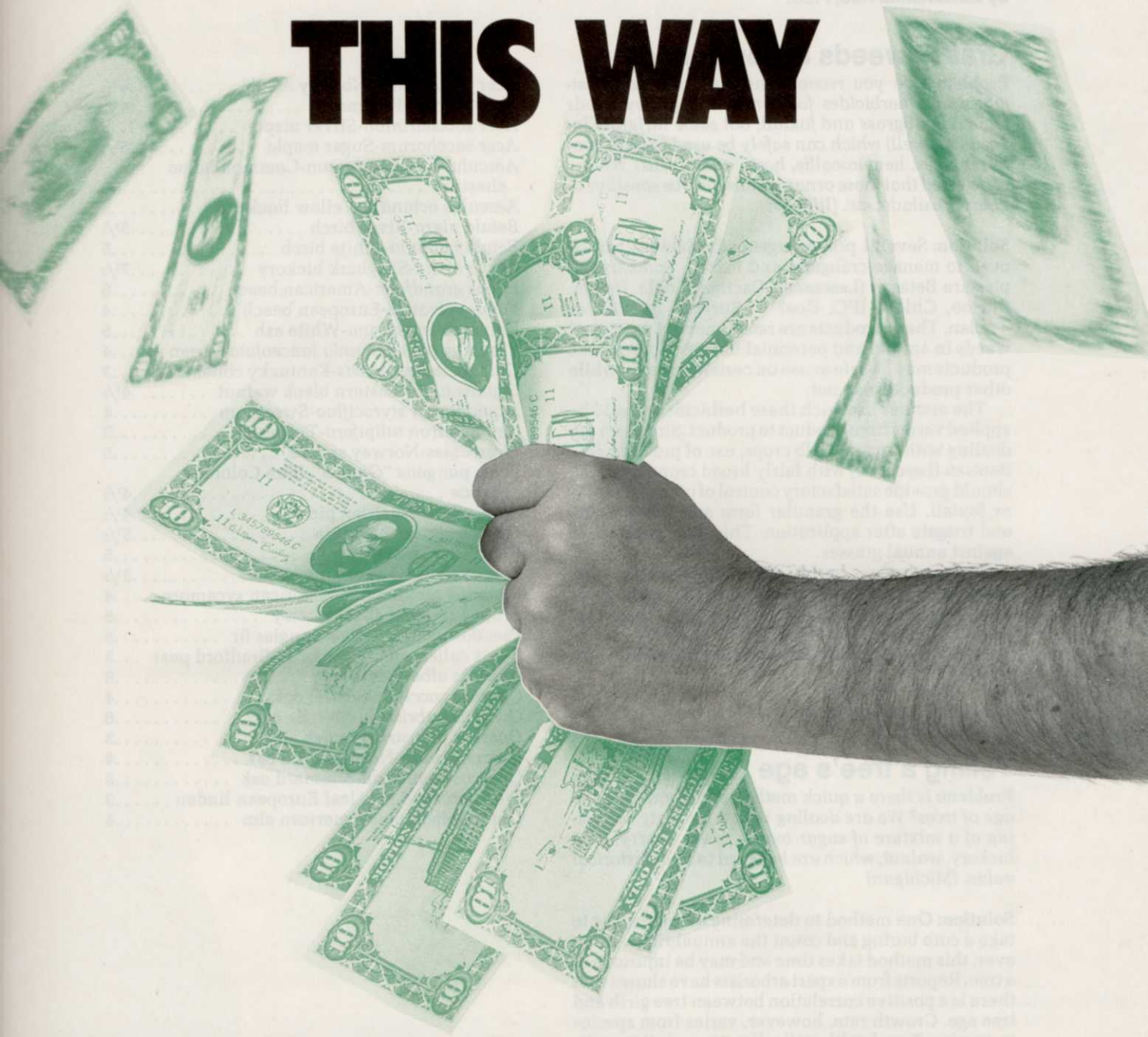

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PROBLEM MANAGEMENT

by **Balakrishna Rao,** Ph.D.

Grassy weeds in flower beds

Problem: *Can you recommend both pre- and post-emergence herbicides for controlling grassy weeds (chiefly crabgrass and foxtail, but some turfgrass invasion as well) which can safely be used in beds containing iris, hemerocallis, hosta and crocus? We are concerned that these ornamentals may be sensitive to Poast, Fusilade, etc. (Illinois)*

Solution: Several pre-emergence herbicides can be used to manage crabgrass and foxtail. Some examples are Betasan (Lescosan), Dacthal, Enide, Eptam, Furloe, Chloro IPC, Goal + Surflan, Surflan or Treflan. These products are recommended to control weeds in annual and perennial flowers. Some of the products may be safe to use on certain flowers, while other products may not.

The manner in which these herbicides should be applied varies from product to product. Since you are dealing with several bulb crops, use of products like Betasan (Lescosan) with fairly broad crop tolerance, should provide satisfactory control of crabgrass and/or foxtail. Use the granular form and incorporate, and irrigate after application. This is most effective against annual grasses.

Post-emergence herbicides are not generally recommended for use in annual and perennial flowers. Most post-emergence herbicides like Roundup, Amitrol, Dowpon and Poast are non-selective materials. Read and follow label specifications for best results.

Telling a tree's age

Problem: *Is there a quick method of determining the age of trees? We are dealing with a property consisting of a mixture of sugar maple, black cherry, elm, hickory, walnut, which are believed to be of historical value. (Michigan)*

Solution: One method to determine a tree's age is to take a core boring and count the annual rings. However, this method takes time and may be injurious to a tree. Reports from expert arborists have shown that there is a positive correlation between tree girth and tree age. Growth rate, however, varies from species to species. Tree health, soil, climatic and site conditions can have a significant effect on the rate of annual growth.

The tree's age can be fairly estimated using a simple formula published by the International Society of Arboriculture. First, determine tree diameter in inches measured at 4½ feet above ground level. The diameter can be determined by dividing the circumference by 3.14. Refer to the following table to find different factors for various species. Multiply the diameter in inches by the designated factor to determine the estimated age of trees.

Tree species, variety or cultivar	**Factor**
Abies concolor-White fir	7½
Acer campestre-Hedge maple	4
Acer nigrum-Black maple	5
Acer platanoides-Norway maple	4½
Acer rubrum-Red maple	4½
Acer saccharinum-Silver maple	3
Acer saccharum-Sugar maple	5½
Aesculus hippocastanum-Common horse chestnut	8
Aesculus octandra-Yellow buckeye	5
Betula nigra-River birch	3½
Betula pendula-White birch	5
Carya ovata-Shagbark hickory	7½
Fagus grandfolia-American beech	6
Fagus sylvatica-European beech	4
Fraxinus americana-White ash	5
Fraxinus pennsylvania lanceolata-Green ash	4
Gymnocladus dioicus-Kentucky coffeetree	3
Juglans nigra-Eastern black walnut	4½
Liquidambar styraciflua-Sweetgum	4
Liriodendron tulipifera-Tuliptree	3
Picea abies-Norway spruce	5
Picea pungens "Glauca"-Blue Colorado spruce	4½
Pinus nigra-Austrian pine	4½
Pinus resinosa-Red pine	5½
Pinus strobus-White pine	5
Pinus sylvestris-Scot pine	3½
Platanus occidentalis-American sycamore	4
Prunus serotina-Black cherry	5
Pseudotsuga menziesii-Douglas fir	5
Pyrus calleryana "Bradford"-Bradford pear	3
Quercus alba-White oak	5
Quercus coccinea-Scarlet oak	4
Quercus imbricaria-Shingle oak	6
Quercus palustris-Pin oak	3
Quercus rubra-Northern red oak	4
Quercus shumardii-Shumard oak	3
Tilia cordata-Little leaf European linden	3
Ulmus americana-American elm	4

Balakrishna Rao is Director of Lawn Care Technical Resources for The Davey Tree Co., Kent, Ohio.

Questions should be mailed to Problem Management, Landscape Management, 7500 Old Oak Boulevard, Cleveland, OH 44130. Please allow 2-3 months for an answer to appear in the magazine.

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Biological control of annual bluegrass

by David L. Roberts, Ph.D., Michigan State University

Traditional weed control in agriculture has been accomplished primarily through the use of chemical herbicides and cultivation. Cultivation practices are of little use for weed control in turfgrass management.

Turf managers, therefore, tend to rely heavily on chemicals for weed control. Chemical herbicides tend to exhibit rather broad spectrum characteristics. Two common examples are 2,4-D and glyphosate (Roundup, Rodeo, etc.). The advantage of such broad spectrum activity is that, for example, with 2,4-D many broadleaf weeds will be affected by one chemical.

In the case of glysophate, virtually all plants will be affected, making this a very important renovation tool. The disadvantages of broad spectrum chemicals is that non-target plants may be affected. A slight gust of wind can carry that herbicide to some landscaping trees or shrubs, putting an end to the tender loving care that was needed to properly establish these plants at the site.

Another disadvantage is that weeds from the same family or group of plants as the desirable propagated plant cannot be controlled without also harming the desirable plants.

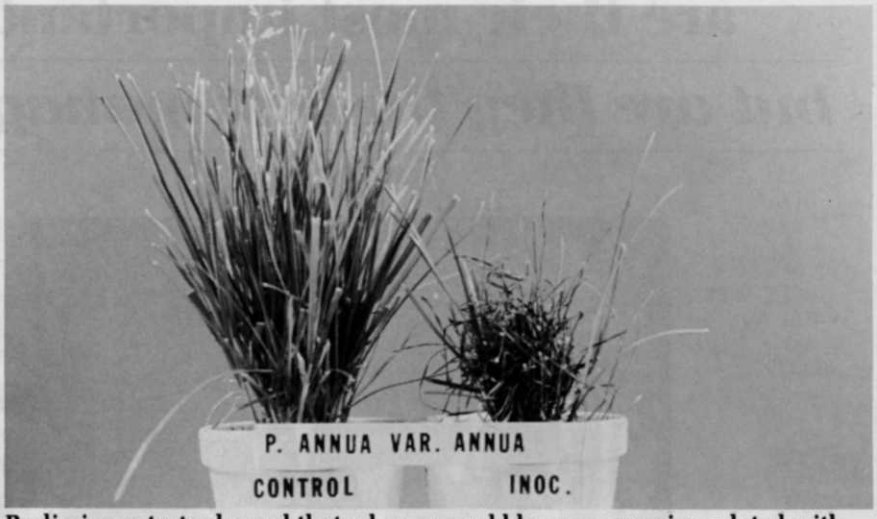
Very few chemicals exist that are species or cultivar specific. It is precisely this characteristic that makes annual bluegrass *(Poa annua)* the most important weed problem on golf courses, lawns and other turfgrass sites.

No chemicals currently exist that can selectively eliminate annual bluegass from desirable Kentucky bluegrass *(Poa pratensis)* and creeping bentgrass *(Agrostis palustris)*.

The problem is compounded by the fact that, whereas annual bluegrass seeds will normally be controlled by a pre-emergence herbicide, annual bluegrass also occurs as a perennial *(Poa annual var. reptans)*. Clearly an effective control is needed because the annual bluegrass component of many lawns and golf courses exceeds 50 percent of the grass species.

Poa attacker

A bacterium that attacks annual bluegrass was discovered in Michigan in 1984 and 1985. The bacterium was first observed selectively suppressing annual bluegrass in golf course and lawn sites. Through various physiological-biochemical, morphological and immunilogical criteria, the bacterium was characterized as a type of *Xanthomonas* species.



Preliminary tests showed that when annual bluegrass was inoculated with the bio-control bacterium, plants succumbed within two weeks. Non-inoculated control plants remained healthy and continued to grow.

Preliminary studies in the laboratory demostrated that the bacterium could effectively suppress and kill annual bluegrass (Photo 1).

Symptoms began to be expressed approximately five days after inoculation of the annual bluegrass with the bacterium. The weed was killed 1½ to 2 weeks after inoculation.

Microscopy studies showed that the bacterium is systemic within the plant. The xylem vessels, which transport fertilizer and water nutrients from the roots to the leaves, was affected by the bacterium.

Further experiments revealed that in mixed stands of grasses, the bacterium will selectively eliminate only the annual bluegrass. In all the experiments, the Kentucky bluegrasss and creeping bentgrass continued to grow unharmed (Photo 2).

In fact, concentrations have been increased 1,000 to 10,000 times without any effects upon the desirable grasses. We have also performed very successful overseeding programs.

When mixed stands of annual bluegrass, Penncross creeping bentgrass and Adelphi Kentucky bluegrass were inoculated with the bio-control bacterium, only the annual bluegrass was suppressed and eventually killed.

If developed into a marketable product, we would anticipate that the bacterium would require four or five applications the first year for a renovation program. Thereafter, we suspect one or two applications per year may be needed to keep annual bluegrass from re-establishment into maintained turfgrass areas.

This biological herbicide is unique. It is highly selective, affecting only one species of the grass family. None of the many tested cutivars (or varieties) of Kentucky bluegrass creeping bentgrass, ryegrass, fescue, rice, wheat, corn, oats, etc. have been affected by the bacterium.

Our observations of natural field situations suggest that the bacterium practically disappears to non-detectable levels several weeks after application. This is an advantage over some chemical pesticides which have been known to linger in the environment for many months.

Field testing has begun. We hope that other strains may be developed that selectively controls other weeds. If so, the biological herbicides may provide effective alternatives to chemical pesticides, particularly those that are harmful to people and the environment. **LM**

The author expresses sincere appreciation to cooperators Ron Setweiler and Joseph Vargas, Ph.D.

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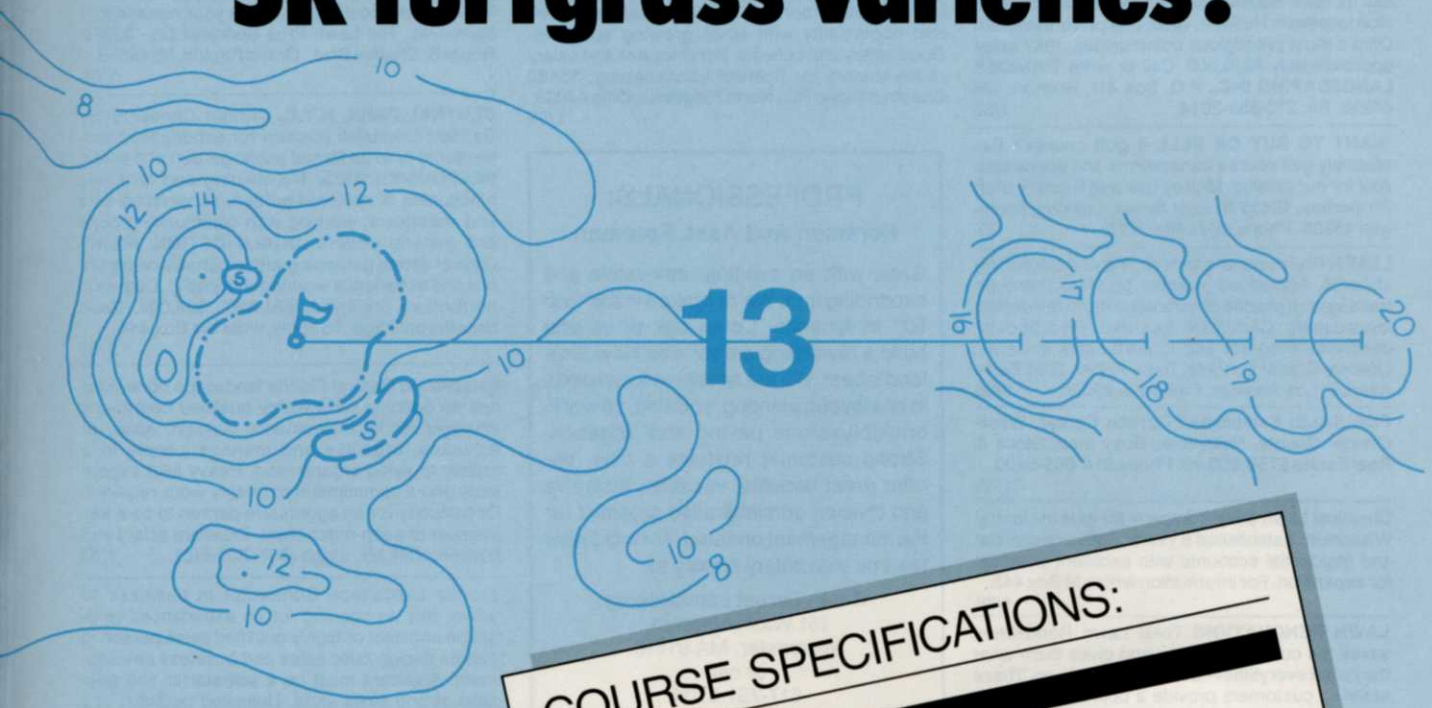

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CENTRAL PARK, N.Y.C. Curator Conservatory Garden: Executive position for experienced horticulturist in large formal public garden of 6 acres. **RESPONSIBILITIES:** Maintaining and directing functioning of restored garden, supervising staff and volunteers; working with community groups and general visitors. **QUALIFICATION:** Knowledge of estate gardening with emphasis on perennial and experience working with public. Degree in horticulture preferred. **SALARY:** $28,000. Good benefits package. To apply, write LM Box 444. 2/88

Established Central Florida landscape contractor has an opening for a highly qualified operations manager for its maintenance division. Ability to schedule, organize and manage people in a rapidly growing organization. Heavy field experience and a commitment to quality work required. Opportunity for an aggressive person to be a key member of a top-notch team. Excellent salary and benefits. Call Mr. Singh (305) 831-8101. 1/88

Florida Landscape Contractor in business 15 years, has an opening for an experienced landscape architect or highly qualified sales person to handle design build sales and business development. Applicant must be a self-starter and possess strong sales skills. Unlimited potential in a growing firm with a top notch track record. Contact Mr. Singh (305) 831-8101. 1/88

Landscape Architects/Supervisors (project foremen) to join a nationally acclaimed firm looking to expand into its second generation Long Island area supports a high budget landscape industry. Year round employment, company benefits and continuing education available. Experienced and aggressive people send resume to: **GOLDBERG & RODLER, INC.,** 216 East Main Street, Huntington, New York 11743. 1/88

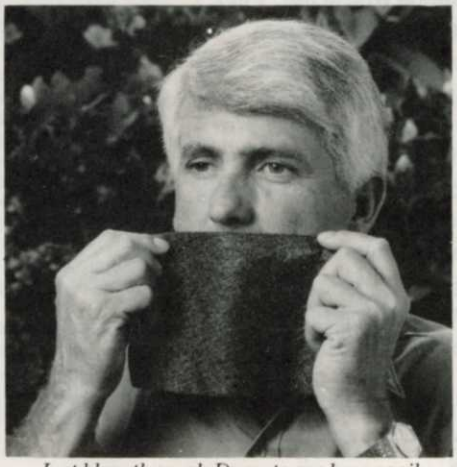
IPM Technician - Excellent opportunity for knowledgeable, experienced professional. Must be familiar with trees, shrubs, insects, and diseases of the Northeast U.S. Ability to diagnose problems and treat with appropriate chemicals on site required. Additional training will be provided. Join fast growing company with excellent pay and benefits. Send resume to Don Becker, Director of Operations, Sav-A-Tree of Westchester, Inc., P.O. Box 527, Armonk, NY 10504-0527. (914) 666-8202. Position available February 1988. 2/88

TECHNICAL MANAGER. Assistant Director needed to plan & develop plant & tree program with largest landscape management company in Washington, D.C. area. Horticultural background, BS preferred. Application experience and knowledge in program development helpful. Excellent growth opportunity and benefits. Send resume to LM Box 446. 1/88

LANDSCAPE CONSTRUCTION SUPERVISOR - Experienced individual needed to oversee several landscape crews on commercial and residential sites. Work involves coordination of foreman, laborers and equipment. This is a permanent salaried position. We are located in Hempstead, Long Island and are one of the largest landscape contractors in the metropolitan area. Send resume to Harder Landscape Contractors, Inc., 63 Jerusalem Avenue, Hempstead, NY 11551. 1/88

THIS TEST WON'T HOLD WATER —OR AIR.

Water passes easily through highly permeable Duon Weed Control Mat.



Just blow through Duon to see how easily air passes through it.

The proof is stronger, longer lasting plants with DUON® Weed Control Mat.

Both water and air pass easily through Duon Weed Control Mat, made of Phillips Fibers nonwoven polypropylene. As a landscaper, you know how important that is to a plant's root system and to the future well-being of your big landscape jobs—especially those you use as references.

When water and air can't get through, plants die. Black plastic won't work for the long-term. And woven polypropylenes are nowhere near as permeable as nonwovens. For example, the air permeability for nonwoven Duon is about 14 times greater than for woven polypropylenes and the water permeability for Duon is about 10 times greater.

Put our words to the test. Hold Duon under running water, then take another piece and breathe through it. Then try the same test with a competitive weed control mat.

When covered from sunlight, Duon is virtually permanent. It allows plants to thrive and impedes about 95% of weed growth (in most areas). It also keeps mulch from going down into the soil.

For your quality landscape jobs, order Duon. For further information, call Phillips Fibers (803) 242-6600.

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P. O. BOX 66, GREENVILLE, SC 29602
(803) 242-6600

*Trademark Phillips Petroleum Company

Circle No. 141 on Reader Inquiry Card

HELP WANTED

Help Wanted—Grounds management supervisor—**AWARD WINNING CORPORATION** is seeking grounds management supervisor. Must be "intelligent" and self-motivated with a minimum of 2 years "hands-on" supervisory experience. Must be able to schedule, train and motivate crews of 9 - 12 in all phases of grounds care. Horticultural degree and pesticide license beneficial. Send resume with salary requirements to A&R Landscaping, 500 Tidewater Drive, Norfolk, VA 23504. 1/88

LANDSCAPE MAINTENANCE FOREMAN

We want someone who is the "Felix Unger" of lawn maintenance. In short, someone who is meticulous, neat and organized to head up our maintenance crews. We want professionals who take pride in their workmanship. Terrific benefit package and incentive program. Forward resume and salary history to:

Green Carpet Landscaping
161 Washington St.
Worcester, MA 01610
or call
617-791-3704

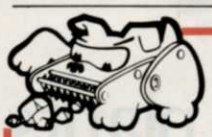
LANDSCAPE MAINTENANCE SUPERVISOR: Scapes, Inc., a commercial landscape firm in Atlanta, Georgia, is seeking an individual who has strong management skills, as well as, extensive landscaping experience and knowledge of plants. Advancement potential — up to Division Manager — makes this position ideal for a goal oriented individual. 404-956-7500. TF

MANAGEMENT: Ever-Green Lawns Corporation, a division of the multi-national Hawley Group, Ltd. is looking for experienced lawn and tree care professionals. Please respond in writing only to Richard D. Niemann, Corporate Recruiter, Ever-Green Lawns Corp., 1390 Charlestown Industrial Drive, St. Charles, MO 63303. TF

HELP WANTED - Person to work on growing tree farm. Must have complete knowledge of growing, digging, and marketing trees. Only those willing to work need apply. Cranmer Grass Farms, Inc., 2501 N. Maize Road, Wichita, KS 67205. 1/88

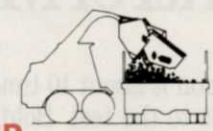
We are looking for a Landscape Supervisor with experience in leading and working with installation crews. Duties include job scheduling, estimating, reading blueprints, staking jobs, and pruning. We are located in the heart of the Blue Grass State of Kentucky. Family owned business since 1841. Benefits include paid vacation after 1 year, health insurance plus profit sharing. Your salary is negotiable depending on experience. Contact Stephen Hillenmeyer, C/O Hillenmeyer Nursery, 2370 Sandersville Road, Lexington, KY 40511. 2/88

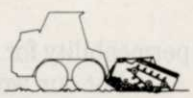
LANDSCAPE INSTALLATION SPECIALIST - Supervisor for well established landscape company. Must be able to read and carry out a set of landscape plans. Must be willing to work. Cranmer Grass Farms, Inc., 2501 N. Maize Road, Wichita, KS 67205. 1/88



ROCKHOUND TEACHES THE ABC'S OF GROUND PREPARATION

A SERIES ROCKHOUND


Dumping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3 Point Mount

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Open bottom—Hydraulic Drive. Rocks are raked to a convenient windrow for later pickup.

COST EFFECTIVE ROCKHOUNDS Rake and collect rocks and surface debris, leaving the soil in a fluffy, level, seed-bed quality condition.

It does not cost to own a Rockhound . . . IT PAYS!

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KEM ENTERPRISES, INC.
1312 Sunset Pl. N.E., Tacoma, WA 98422

Circle No. 128 on Reader Inquiry Card

Site Superintendent

Must have 5 years experience in major commercial landscape construction projects and a thorough knowledge of building construction.

Send resume to:

Mr. R. Scofield
Environmental Industries
Department 200
24121 Ventura Boulevard
Calabasas, CA 91802

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LANDSCAPE & IRRIGATION FOREMEN

Established landscape contractor expanding and in need of aggressive, motivated people to run landscape, irrigation and maintenance crews. Excellent opportunity for advancement. Send resume to:

Alpine Gardens
1958 Balsam Avenue
Greeley, CO 80631

Kansas City based Corporate Care, Inc. is in Search of Excellence! Our landscape department seeks an experienced leader as **Division Chief.** With projects exceeding $500,000, a well educated, experienced and ambitious leader can further assist in attaining our Corporate and personal goals. We also seek an experienced and ambitious **Crew Foreman.** We seek leaders and ask that if a landscape management career is for you, send resume: Corporate Care, Inc., 3305 Terrace, Kansas City, MO 64111 or call (816) 931-6340. 1/88

HELP WANTED - HORTICULTURAL SUPERVISOR: Position for educated and experienced working Horticultural Supervisor at a rapidly expanding 150 acre corporate Sculpture Park and Arboretum. The general scope of the work will include the care of herbaceous borders, woody ornamentals, water lily gardens, greenhouse propagation of unusual plants, and training and supervision of the staff. We offer excellent benefits and the opportunity to work with distinguished professionals. Please send resume and salary history. CARMINE LABRIOLA, CONTRACTING CORPORATION, Providing Horticultural Services to Corporate Landscapes, 200 JOHNSON ROAD, SCARSDALE, NEW YORK 10583. 1/88

Experienced Landscape Forman

Must be experienced in all phases of landscape installation and be able to handle a landscape construction crew.

Please send resume to:

Mr. R. Scofield
Environmental Industries
Department 200
24121 Ventura Boulevard
Calabasas, CA 91802

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Out Hauls - With the Largest Pickup Bed* (50"x50"x11"/16½ cubic feet) and biggest gross payload (one-half ton) in the industry, the Carryall II becomes the most functional, practical and economical vehicle around.

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* Club Car Exclusive Features.

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Circle No. 111 on Reader Inquiry Card

HELP WANTED

CAREER OPPORTUNITIES

ORKIN LAWN CARE (a division of Rollins, Inc.), is one of the nation's largest and fastest growing Lawn Care Companies. With over 43 branches located in 12 states our expansion plans for FY88 will require more proven management.

We are looking for Branch, District and Region Management talent, as well as, Sales and Service Management employees.

If you are ready to join an aggressive company with over 87 years of service business experience, one that is stable, growing and one where you can build a strong career with unlimited advancement opportunities then send your resume TODAY or call 404-888-2771.

Personnel Director
Orkin Lawn Care Division
P.O. Box 647
Atlanta, GA 30301

Sprinkler Controller Tech.—Seeking qualified applicant with working knowledge of maintaining sprinkler control systems. Will be required to observe system and operation and make routine repairs. Must have valid CA drivers license. We offer excellent benefits. Please send resumes with salary requirements to Forest Lawn Memorial Park, 1712 S. Glendale Ave., Glendale, CA 91205. 1/88

Working managers experienced in all phases of lawn servicing looking for opportunity to grow. We offer lots of work, advancement opportunities to the right people, good to excellent compensation and security. Must be willing to relocate to the East coast (Washington D.C. area) or if you're the right person we will consider you for a new office from Virginia Beach to Northern New Jersey. Call or write to: Ron Miller, Super Lawns, P.O. Box 34278 Bethesda, MD 20817, 301-365-4740. 2/88

ARBORISTS: Fast moving and well respected arboricultural firm in Southern California looking for bright, energetic, dedicated and responsible person. Self-starter to head new sales, personnel management, field operations, contract bidding and negotiations and full supervision for all manpower and equipment. Applicants must have horticultural background, college degree, direct practical experience, and computer knowledge preferred. Salary commensurate with background. Good company benefits with strong growth potential. Send resume with salary history (mandatory) in strictest confidence to LM Box 430. 1/88

Horticulturist - Professional position, responsible to Parks Superintendent for planning and overseeing the planting and cultivation of flower beds, ground cover and landscape materials. Assists in lawn and athletic turf management program. Orders and maintains proper inventory of plant and related supplies. Four year college degree in horticulture or closely related field with two years experience highly desired. Salary range to $25,459 with entry rate dependent upon training and experience. Benefits. Submit resume by January 29th 1988 to: Personnel Director, Kettering Government Center, 3600 Shroyer Rd., Kettering, Ohio 45429. **EQUAL OPPORTUNITY EMPLOYER.** 1/88

MANAGEMENT TRAINEE
ServiceMaster LawnCare

We are a multi-national service company looking for people to train for management positions in our rapidly expanding franchise operation. We need people with good communication skills, customer service orientation, and willingness to relocate. We offer compensation based on ability and productivity, complete benefit package, and the opportunity to grow with the number one service company of the Fortune 500. Please respond with resume, salary history and requirements to:

ServiceMaster Industries
LawnCare Division
2300 Warrenville Road
Downer's Grove, IL 60515.

Opportunity for Lawn Care Professional in fast growing quality minded company in Eastern Long Island. Excellent earning potential. Experience in sales, agronomy, and turf management a must. Write to LM Box 441. 2/88

PRODUCTION/SALES/MANAGEMENT — Aggressive Texas full-service landscape firm now accepting resumes for entry level positions in sales, production and management. Excellent opportunities for career, growth oriented persons. Send full resume to LM Box 443. 1/88

LANDSCAPE DESIGNER AND ESTIMATOR. Design/build landscape construction firm is seeking an experienced designer and estimator. Must be able to handle the job from sales to completion of job. Must have good graphic ability. Salary and benefits commensurate with ability and experience. Send resume to: P.O. Box 725, Utica, MI 48087. 1/88

Gazebo Dealers Wanted. Huge profits selling preassembled gazebo kits. Different sizes and styles available. High quality kits manufactured in Michigan. Shutt Construction Co., P.O. Box 397, Williamston, Michigan. Phone (517) 655-1915. 4/88

HELP WANTED: Landscape, turf and spray foremen, nurserymen and pruners. Experience and/or education necessary to work for our dynamic, quality oriented, large, 40 year established company in the Hamptons on Long Island. Professional wages and benefits, year round, full time positions. Contact: Whitmore-Worsley Inc., P.O. Box 10, Amagansett, NY 11930. (516) 267-3756. 3/88

Finn Finishes First...again

After 4 years of development and testing the Finn Corporation is proud to announce the new T90 HydroSeeder. This 800 gallon working capacity model is a joint effort of field input and Finn's 50 years of experience. By combining these efforts, Finn developed the highest quality and most efficient machine in the industry. Check it out.

New tank design and agitator allows rapid mixing of heavy slurries.

Clean functional design.

Quick and easy loading with front hatch.

Spray distances up to 150 feet and plug free performance from all new pumping system.

Better over the road/off road performance from a heavier suspension.

For all the facts about the new Finn T90 and other Finn HydroSeeders and Mulch Spreaders call or write us today.

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Circle No. 121 on Reader Inquiry Card

CENTRAL PARK CHIEF OF OPERATIONS

The City of New York, Department of Parks & Recreation is seeking an experienced manager to oversee a diversified work force of 200 responsible for the operation of this major regional park. Areas of involvement include: Horticulture & Forestry, Maintenance & Operations & Special Events.

Qualifications: Five years experience in management positions, the ability to develop and track budgets, excellent analytical and leadership skills, and the ability to work with community and constituent groups.

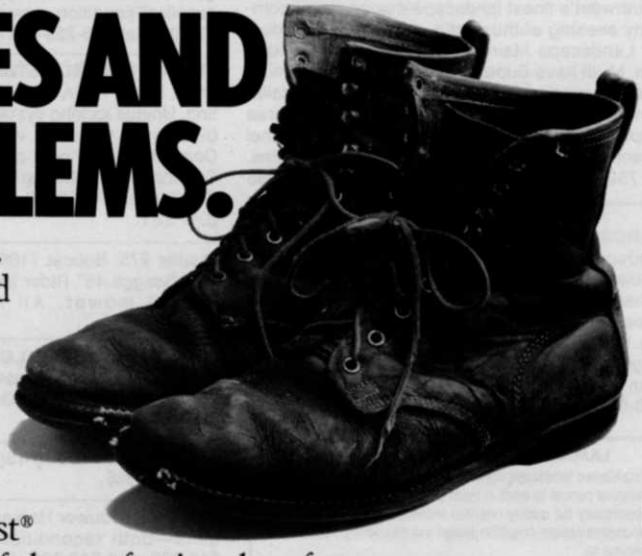
Salary commensurate with experience. NYC residency required.

Send resume to:

CITY OF NEW YORK PARKS & RECREATION
Recruitment Division
The Arsenal, Central Park
New York, NY 10021

Equal Opportunity Employer

BEFORE WE DEVELOPED THESE PROBLEM-SOLVING TURFGRASS MIXTURES, WE MARCHED THROUGH ACRES AND ACRES OF PROBLEMS.



Nobody knows the troubles we've seen.

Our Northrup King turf specialists and researchers have hoofed through salt problems, soil compaction, disease, starved turf, baked turf, cleated-to-shreds turf, and dormant winter turf—all depressing sights. But it was a road well worth our travels.

The result is a complete line of Medalist® turfgrass formulas that meet the demands of the professional turf manager.

If you've been staring down at a turf problem, look up your solution here. And if you think it's a turf problem we haven't seen, just let us know.

Our business is putting your problems behind us.

MEDALIST TURF PRODUCTS ™

MEDALIST TURF PRODUCT	MAJOR AREAS OF USE	SPECIAL FEATURES
Athletic Pro and Athletic Pro II	For athletic turf.	Well suited for new seeding or overseeding. Fast establishing, traffic tolerant, rapid recovery. Both provide good footing.
Boulevard Mix	Any area with high pH (roadsides, sidewalks, boulevards, alkaline soils, etc.).	Contains 'Fults' and Dawson red fescue for beautiful salt-tolerant turf. Performs at low to high fertility levels.
Landscape Pro Mix	School grounds, cemeteries, golf course roughs, home lawns.	Establishes fast. Adapts to broad range of conditions and management levels. Low to moderate fertility needs.
Overseeder II Mix	Fairways, tees, athletic fields.	Rapid germination and establishment. Withstands heavy traffic and resists diseases. Penetrates compacted soils.
Medalist North Mix	Fairways, tees, cart paths, wear areas.	Quality turf for high traffic areas. Clean mowing and disease resistant.
Premium Sod Blend	Commercial sod production.	Exceptional dark green color. Tolerates light shade. Superior disease resistance. Rapid sod producer.
Renovator Pro Mix	Problem solver for heavy traffic areas (athletic fields, golf tees, and fairways).	Penetrates compacted soils and combats *Poa annua.* Adaptable to most geographic regions.
Medalist Brand Overseeding Products	Winter overseeding of dormant bermudagrass.	Establishes rapidly and evenly. Tolerates traffic while providing a superior putting surface. Smooth spring transition.

Ask your Northrup King distributor about Medalist Turf Products to solve your turf problems. Or write Northrup King Medalist Turf Products, P.O. Box 959, Minneapolis, MN 55440.

Circle No. 138 on Reader Inquiry Card

WINNERS ONLY: If you love the lawn care business, and are still looking for your personal security and comfort levels, send us your resume. Your experience should be in all phases of lawn care, management, customer sales and service. We are expanding our operations and will offer the right individual a unique once in a lifetime opportunity. When you prove your abilities, we'll guarantee your success. Send your confidential resume to: P.O. Box 5677, Rockville, MD 20855. 2/88

Southwest's finest landscape management company seeking enthusiastic, motivated individual for Landscape Maintenance Supervisor's position. Must have Supervisor's ability and minimum 2 years experience in maintenance and/or installation. Agricultural related background or degree helpful. Send resume/work history to: Personnel Director, Maintain, Inc., 2549 Southwell, Dallas, TX 75229. 1/88

LANDSCAPE SUPERVISOR. Well-established landscape contractor has immediate opening available in the construction division. Must have either landscape or construction industry experience and have a class "C" license for truck driving. We offer motivated individuals an opportunity to grow with a company with a strong future and many benefits. Amlings Landscape Co., (312) 850-5096. 2/88

LANDSCAPE DESIGNER/SALESPERSON

Established landscape contractor seeking self-motivated, aggressive person to work in team atmosphere. Excellent career opportunity for quality-oriented individual with knowledge of landscape design, irrigation design and estimating. Please send resume to:

Alpine Gardens
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FOR SALE

USED EQUIPMENT FOR SALE—Hydroseeder - 1500 gal. Bowie mounted on Tandem Diesel Truck, $14,500. Backhoe attachment for Bobcat, 700 Series, $2,900. Call 216-357-8400 or write EQUIPMENT, 1447 N. Ridge Rd., Painesville, OH 44077 for photos. 4/88

SPRAY TRUCK: 1979 International S1700, 1150 gallon tank with 2 reels and hose, Bean 20 pump, excellent condition, new paint, production ready, $7,500. Call 816-229-5051 Steve or John. 1/88

THE AFFORDABLE STUMP CUTTER: Stainless Steel, HEAT TREATED, 5½ lbs., FAST, SAFE cutting. Unique locking system holds 6 grooved carbide teeth removed with one recessed bolt. Compatible with new or old two wheel Gravely Tractors. Kinetic Stump Cutter Inc., 1220 W. Hawie St., Jupiter, FL 33458 or (305)744-0680 after 5 p.m. EST. 3/88

Hustler 275, Bobcat T186 lawn mowers for sale, also Scaggs 48" Rider along with assorted walk behind mower. All in good condition, 516-267-7789. 4/88

BOWIE HYDRO-MULCHERS AND STRAW BLOWERS, New and used. Landscape Supply, Ltd., P.O. Box 22092, Greensboro, NC 27420. (919) 292-2922. 3/88

Meyers 2C95 Centrifugal pump, $350. Call 715-341-7956. 1/88

Two used Brouwer Harvesters, Fords, 18" rolling units—both reconditioned and ready to go. $19,000 and $18,000. Model 3500 Hitchhiker, $14,000, Model 3600 Hitchhiker, new and demos. Like new Spyder diesel, $15,000. Baker York—perfect shape, $8,000. 219-552-0552. 1/88

Ungalvanized Wire Baskets and Burlap Liners for tree spades and hand dug made by Colorado Wire Products, 9432 Motsenbocker Road, Parker, CO 80134. 303/841-3354. TF

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Of Weeds, Brush And Weed Trees!

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Spot treatment cuts labor, materials. Automatic — Adjustable — Accurate.

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ZOYSIA MEYERS Z-52 SOD OR SPRIGS. EXCELLENT QUALITY DELIVERED ANYWHERE AT REASONABLE PRICES. ALSO ROW PLANTING AVAILABLE. DOUBLE SPRINGS GRASS FARM, SEARCY, AR. (501) 729-5691. TF

For Sale: Lawn-A-Mat (7) Economy Tractors (14-16 HP), (7) combines and various spare parts. 513-242-7300 evenings 513-385-5336. 1/88

Olathe Chippers for the tree care professional

Olathe Chippers reduce bulk — cuts down time to landfill sites. Provides mulch for safety and beautification progams. Olathe manufactures five models to handle your chores — from 8 hp 2½" capacity to 100 hp 12" diam. capacity. With units in the field for over 15 years, Olathe keeps proving itself as a leader in the chipper field.

Model 12 — PTO, 3 pt. hitch or tow-type, 7" capacity, 500 lb. drum.

Model 816 — Debris chipper handles kiln dried lumber and assorted wood debris.

Model 986 — Hydraulic feed disc chipper features: 12" capacity, variable feed rate, gas or diesel, 360° swivel chute, 15° curbside feed angle for operator safety, over 950 RPM drum speed. Compare! Olathe wins!

Write or call your local Olathe/Toro dealer for free demo or call 1-800-255-6438.

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Circle No. 139 on Reader Inquiry Card

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TREE TRANSPLANTERS
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P.O. Box 503, Hales Corners, WI 53130
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HAVE A FIELD DAY

Meet the nation's leading groundskeepers and specialists at the Opti-Gro™ Athletic Field Maintenance Seminar

And get first-hand information on the latest techniques to improve the quality and appearance of your turf and grounds.

This comprehensive, 2-day seminar is designed to increase the effectiveness of your grounds care program and to optimize the return on your maintenance dollars.

For more information about the seminar and how to register, **call TOLL-FREE 1-800-241-3302;** in Georgia, call 404-952-0228; or write: Athletic Field Maintenance Seminar, Opti-Gro Division of MANTEK® , 1775 The Exchange, Suite 300, Atlanta, Georgia 30339.

Atlanta, GA January 11 & 12
Austin, TX January 18 & 19
Houston, TX January 21 & 22
Nashville, TN January 25 & 26
Raleigh-Durham, NC February 1 & 2
Lubbock, TX February 8 & 9
Indianapolis, IN February 15 & 16
Tulsa, OK February 22 & 23
Milwaukee, WI February 29 & March 1
Chicago, IL March 7 & 8
Cincinnati, OH March 21 & 22
The Meadowlands, NJ April 11 & 12

Opti-Gro™
Advanced Grounds Technology
A Division of MANTEK

Circle No. 133 on Reader Inquiry Card

REINCO HYDROGRASSERS and power mulchers in stock. Opdyke Inc. (Philadelphia Area) 215-721-4444. TF

USED HYDROSEEDER in good condition. 800-1200 gallon range. Call **814-837-8606,** ask for Dick. 1/88

Complete 1981 Roseman Hydra-Gang as taken off tractor. Ideal for vert-cuts and/or parts. Contact Philip Mills, P.O. Box 1580, Cumberland, MD 21502. 301-722-6601, asking $2,000. 1/88

ROCK RAKES—Harley TR3-8 3 Pt. Hitch, PTO Drive, Good Condition. **ROCK PICKER** —Anderson E Series, PTO Drive with Hi-Lift, Excellent Condition. Write or call: Bob Ruff, Stoney Creek Golf Course, Wintergreen, Virginia 22958. (804) 325-2200 Extension 530. 1/88

HANNAY REELS: New in the box, E1526s and E1530s, $339.00. Lawn spray hose 275 psi and 600 psi, all sizes. Original Imler measuring wheels, $48.00. Glycerin filled gauges 0-60 psi, 2-02100 psi, $19.95. Polypropylene ball valves ½" to 2" Chemlawn guns $75.95. Lawn spray boots $16.95. Lawn spray gloves $1.25/pr. Call **Hercsh's Chemical Inc., 1-800-**843-LAWN outside of Michigan or 1-313-543-2200. TF

Spray Truck: 1978 Ford F-600 with 1000/250 gallon tanks, hypro pump, mechanical agitation, 2 Hannay reels, each with 450' of hose. Very well maintained $6500 or best offer. Pictures available. Phone (412) 539-3226. 1/88

LAWN SEED. Wholesale. Full line of top quality grasses. Improved bluegrass varieties, fine fescues and fine bladed ryegrasses. We specialize in custom mixing. Oliger Seed Company, 89 Hanna Parkway, Akron, OH 44319. Call collect (216) 724-1266. TF

LAWN SPRAY TRUCK - 1000 / 250 gal. tanks - PTO driven Hypro D-85 pump - separate weed system w/2) 50 gal. tanks w/Hypro D-19 pump - 72 Ford F-600 cab & chassis - currently in use-maint. records available $6,000 obo (813) 932-5100. 1/88

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KELWAY® professional **SOIL ACIDITY** and **SOLUBLE SALTS TESTERS,** available from distributors nationwide. HB-2 and SST brochures from **KEL INSTRUMENTS CO., INC.,** Dept. 1, P.O. Box 2174, Vineyard Haven, MA 02568. (617)693-7798. 11/88

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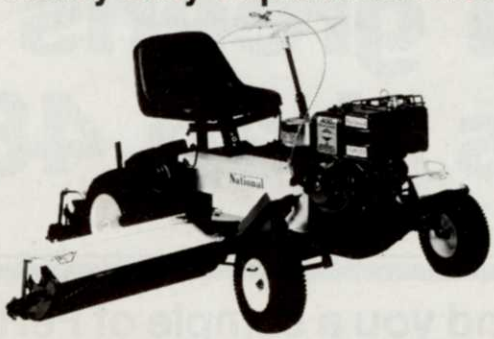

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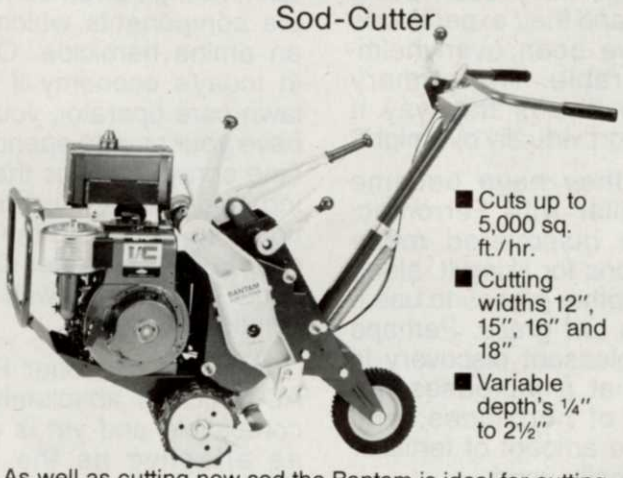
TURFCO **BANTAM**

Sod-Cutter



- Cuts up to 5,000 sq. ft./hr.
- Cutting widths 12″, 15″, 16″ and 18″
- Variable depth's ¼″ to 2½″

As well as cutting new sod the Bantam is ideal for cutting dead, worn or weed infested turf and preparing the ground for installation of new sod. The design incorporates full complement of adjustment for blade depth and angle to meet the demands of different applications. The Bantam now features a 8HP Industrial/Commercial (I/C) engine.

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TURFCO

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New amine-compatible iron greens up turf in less than 48 hours.

Let us send you a sample of FERROMEC® AC (amine-compatible); test it and see for yourself what a valuable tool it is in the management of turf and ornamentals.

Everett Mealman, President
PBI/Gordon Corporation

During the last several years, literally thousands of lawn care companies, landscape management contractors, and other turf professionals have been using Ferromec, and their experiences with it have been overwhelmingly favorable. The primary thing they like is the way it greens up turf virtually overnight.

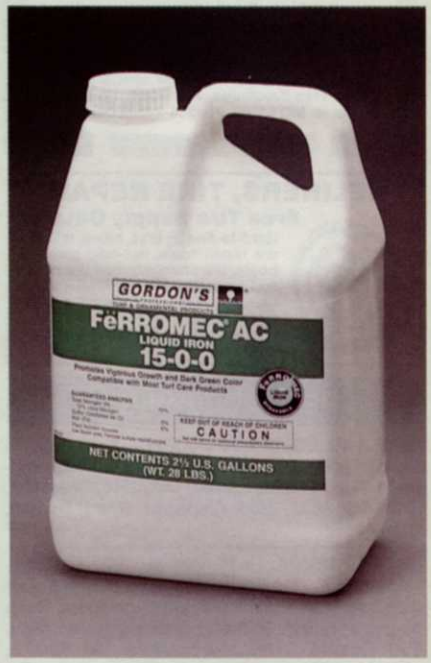
But as they have become more familiar with Ferromec, they have discovered many other reasons for liking it, along with many other places to use it besides on turf grass. Perhaps the most pleasant discovery is the fact that it increases the efficiency of herbicides, and reduces the amount of fertilizer that is normally used.

Nitrogen will eventually produce a green color, but excess nitrogen plus turfgrass equals hay. Obviously, Ferromec is a better way!

On the other hand, some lawn care companies have commented that sometimes their employees have had trouble tank mixing Ferromec with multiple components which include an amine herbicide. Obviously, in today's economy if you're a lawn care operator, you'd rather have your people spending their time spraying lawns than worrying about tank mixing instructions, so we turned the problem over to our Dr. Roger Cahoy; as usual he came up with the right solution.

Now, we can offer Ferromec AC which is absolutely amine-compatible and yet is every bit as effective as the original Ferromec.

We want to send you a sample of Ferromec AC, so you can see for yourself what a valuable asset it can be. Meanwhile you might like to review some of the facts about iron which will help you understand how Ferromec works, and why no other company can offer you a product like our patented Ferromec sprayable iron.



Facts about iron that turf professionals need to remember.

First: **Iron is essential for the synthesis of chlorophyl. No iron . . . no green.**

Second: **In most instances where ornamental turf is being grown there is not enough naturally occurring iron in a useable ferrous state to produce a vibrant green color. Accordingly, a chelated iron must be added to the soil.**

Third: **The only way to get the desired green color in a *relatively short time,* is to speed up the intake of iron through the roots by feeding enough nitrogen to accelerate the growth rate of the grass. This eventually will bring on the green color. But it will also bring on excessive growth which will cause unwanted mowing and exposure to disease.**

St. Augustine grass lawn in Texas showing the darker color (right) produced by Ferromec Liquid Iron applied in early September at 8 oz./1,000 sq. ft. The green-up became visible within 2 hours and the darker color persisted until dormancy, a couple of months later, according to Wallace Menn of Bryan, Texas, a turfgrass specialist who conducted the test.

Half of this green at Hodge Park Golf Course in Kansas City was sprayed with Ferromec and, within 24 hours, the color change was dramatic. Under normal growing conditions, visual response usually occurs between 8 and 48 hours after application. Ferromec is also effective on trees, shrubs and herbaceous plantings.

FeRROMEC® is totally different

Ferromec, on the other hand, works in a totally different way. Ferromec is unique. There is nothing quite like it on the market.

It is a patented process that involves bonding a ferrous iron molecule to a urea molecule. When Ferromec is sprayed on turf it is ingested almost immediately via foliar intake at the point where chlorophyl is formed. Once inside the plant, the iron-urea molecular bond breaks apart because the plant has such a ravenous appetite for nitrogen.

The result is that the iron molecule in Ferromec goes to work almost immediately to create chlorophyl and, depending on the condition of the turf and the weather, the green-up will occur any time within a range of eight to forty-eight hours.

And, of course, the green-up occurs without the excessive growth that would occur if a similar amount of iron was ingested through the roots along with the nitrogen that would be necessary to allow the iron uptake. Using Ferromec for summer turf is ideal because it reduces the amount of nitrogen you need to apply.

Special formulas for special problems

Iron is definitely established as an essential micronutrient required by all plants. Yet the amount required can vary dramatically depending on the PH of the soil and the composition of the fertilizer being used.

Furthermore, there are many situations where zinc and/or manganese are required in addition to iron. Accordingly, we have developed special formulations of Ferromec to cover such situations.

For more information about the use of iron and for your free sample of Ferromec AC, call us.

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In Missouri: 1-800-892-7281
Ask for Sales Service.

"We put down a total of 8 ounces of Ferromec AC per 1,000 square feet when we prepared the Rose Bowl for the 1987 Super Bowl," says George Toma, noted consultant who has been responsible for preparing the fields of all the Super Bowls played to date. "We'll also use Ferromec AC for the 1988 Super Bowl in San Diego," says Toma.

pbi/GORDON CORPORATION
1217 West 12th Street
P.O. Box 4090
Kansas City, MO. 64101

SAMPLE OFFER expires July 15, 1988.

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FeRROMEC® AC

AMINE-COMPATIBLE LIQUID IRON
696-1287

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ADVERTISER INDEX

NO.	ADVERTISER	PAGE NO.
101	Andersons, The	75
102	American Cyanamid/Image (Regional)	78-79
103	American Cyanamid/Pendimethalin	50-51
118	American Cyanamid/Pendimethalin	50-51
104	Barebo Inc.	3
105	Big John TreeTransplanter	101
106	Bluebird International,Inc.	72
107	Brouwer Turf Equipment	73
108	Broyhill Co.	76
109	Bunton Co.	85
110	E.F. Burlingham & Sons	65
	Ciba Geigy Corp./Triumph	56-57
111	Club Car	97
112	Cushman/Turf	CV3
113	Cushman/Frontline	69
114	Cushman/Ryan	42-43
115	Cushman/Ryan	62-63
116	Deere & Co., John	9-14
117	Elanco Products Co./Balon	17
	Environmental Care, Inc.	106
236	Excel Industries, Inc.	77
119	Exmark Mfg.	16
120	Fermenta Plant Protection	5
121	Finn Corp.	98
122	Fuerst Brothers, Inc.	106
123	Gravely International, Inc.	29
124	Great Salt Lakes Minerals & Chemical Corp.	87
125	Hoechst Roussel Agri-Vet Co.	21
126	Howard Price TurfEquipment	55
127	Jacobsen Div. of Textron,Inc.	25
128	Kem Enterprises, Inc.	96
130	Lebanon Chemical Corp.	47
131	Lesco, Inc.	27
132	Lofts Seed, Inc.	CV4
133	Mantek	101
134	Maruyama U.S., Inc.	81
263	Mid-Dakota Corp.	59
136	Milliken Chemicals	53
161	National Mower Co.	103
137	Nor-Am Chemical Co.	67
138	Northrup King Co.	99
139	Olathe Mfg., Inc.	100
140	PBI Gordon Corp.	34-35
162	PBI Gordon Corp.	104-105
141	Phillips Fibers Corp.	95
142	Precision Labs, Inc.	102
144	RGB Labs, Inc.	83
145	Rainbird Sales, Inc.	33
146	Ransomes, Inc.	49
147	Reemay, Inc.	41
148	Reinco Co.	48
149	Rhone Poulenc Ag Co./Chipco 26019	1
150	Rhone Poulenc Ag Co./Ronstar	71
151	Ringer Corp.	61
152	S.C. State Board for Technical And Comprehensive Education (Regional)	91
153	Seed Research Co.	93
154	Snapper Power Equipment	39
155	Standard Golf Co.	40
156	Target Specialty Products	15
157	Tee-2-Green Corp.	CV2
158	Toro Co.	18-19
159	Turf Seed, Inc.	45
160	Turfco Mfg.	103

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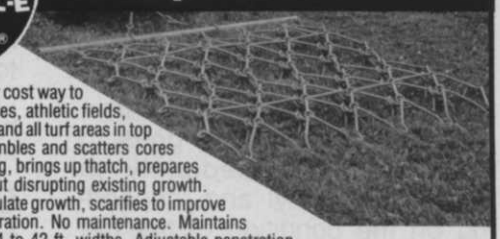

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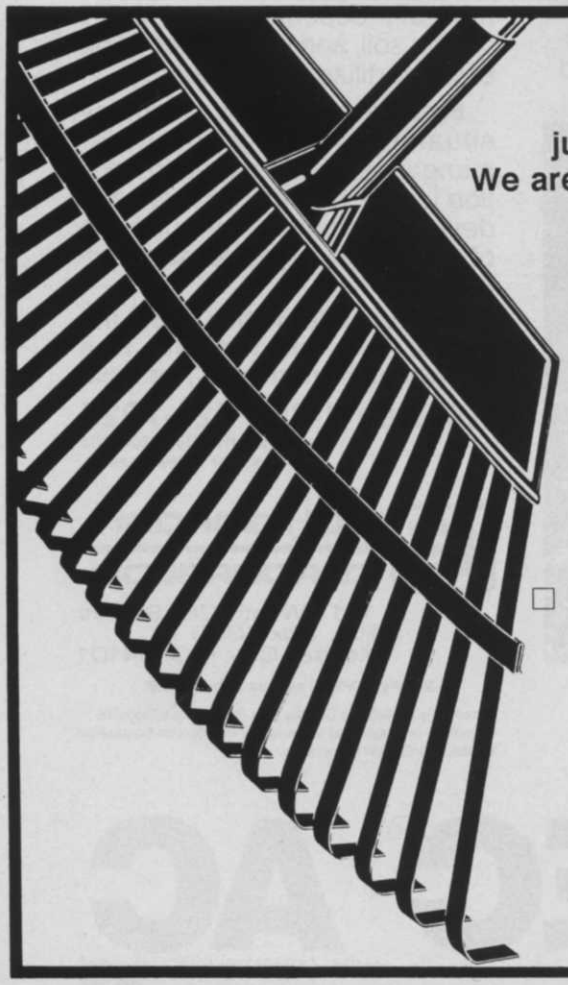

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